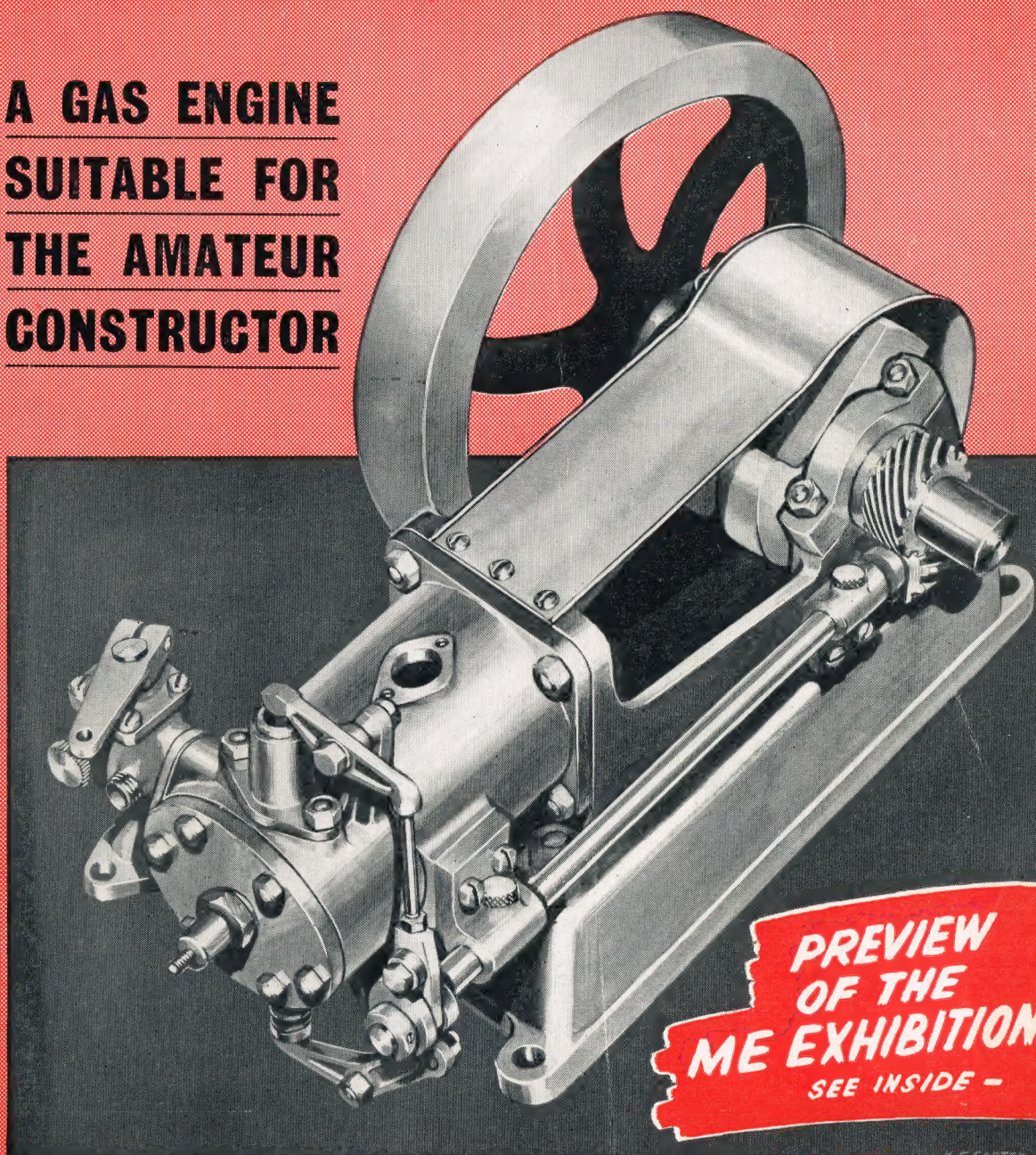


Model Engineer

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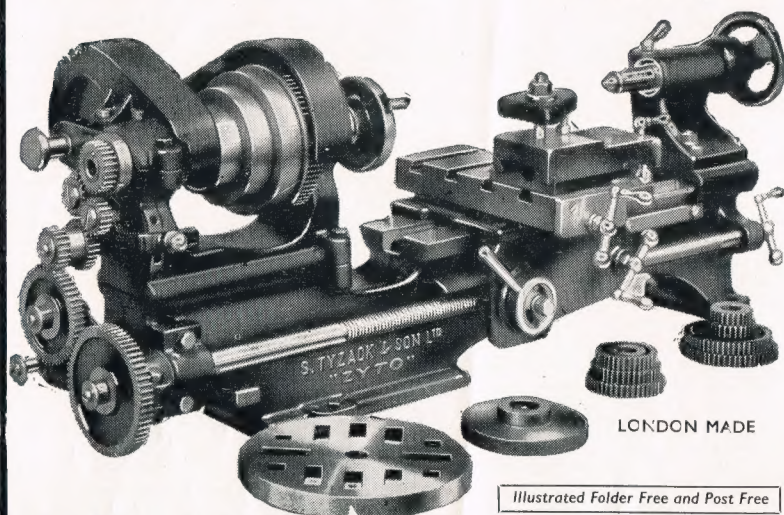
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K. E. CARTER

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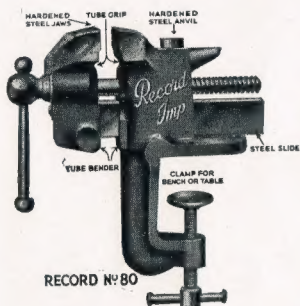
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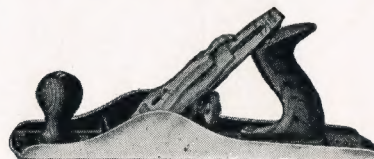
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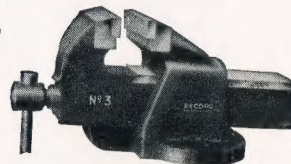
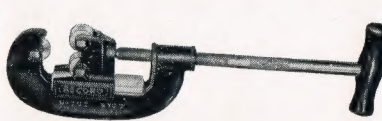
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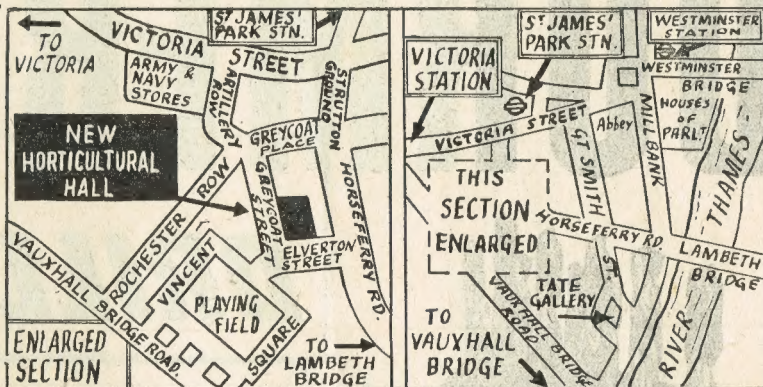
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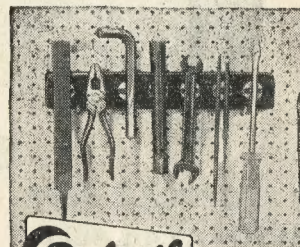
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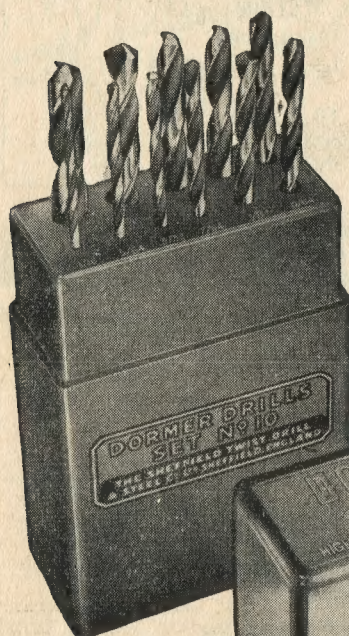
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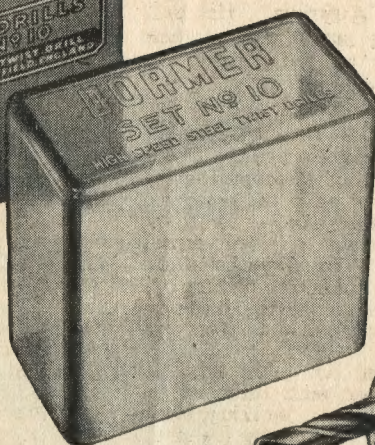


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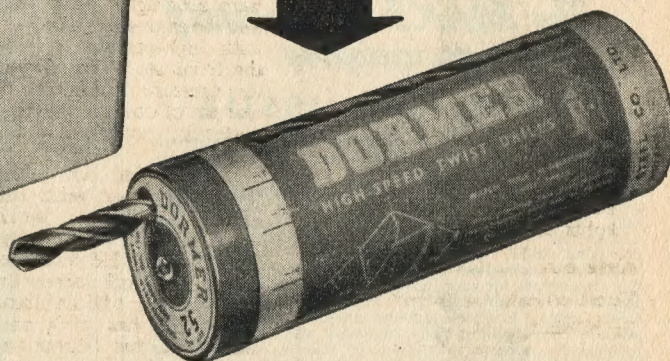


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Model Engineer

ONE SHILLING

15 AUGUST 1957

VOL. 117

NO 2934

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St Ninian

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A WEEKLY COMMENTARY BY VULCAN

THERE are some model engineers who refuse to believe that anything is impossible, and one such is our old friend, A. A. Sherwood, who is now resident in Australia. His skill in producing super-minute steam engines will be remembered by readers who can recall the "Dot" series of boat engines, and the OO gauge 2-10-10-2 Virginian locomotive of a few years ago.

The two sets of 10-coupled wheels were articulated as in the prototype, and the engine was a proper compound with high-pressure cylinders driving the front set of coupled wheels, and low-pressure cylinders driving the rear set of coupled wheels. It worked perfectly; moreover, it was *coal* fired.

Not satisfied with this, however, friend Sherwood must needs try his hand at making a working steam locomotive for OOO gauge ($9\frac{1}{2}$ mm.), 2 mm. scale. He succeeded, and this extremely small locomotive was exhibited at the ME Exhibition in 1951.

Now he has built another, even smaller, in this Lilliputian gauge and he is sending it by air in time for exhibition and demonstration at this year's show. It is a two-cylinder 0-6-0 tank engine built to a scale reduction of the British loading gauge; but it works!

Here are some of the details of this midget: length over buffer beams 2.8 in.; overall width 0.75 in.; height to chimney top 1.1 in.; bore 0.125 in.,

stroke 0.18 in.; driving wheels 0.35 in. dia. The boiler is 0.42 in. dia. and 2 in. long.

Mr Sherwood has promised a description of his model and also a series of articles on the technique of ultra miniature modelling.

Demonstrations

DEMONSTRATIONS have always been an attractive feature of the yearly exhibitions organised by this magazine and this year will see several fascinating examples of this work.

Boys from the Model Engineering Club attached to Enfield Technical College will again man one demonstration stand during the day, the evening sessions being taken over by members of Entech Model Engineering Club, which caters for the interests of Old Students of the College and School.

While each member will be engaged on work on his own model the group will also provide the Exhibition Machining Service.

In previous years demonstrators have been asked to undertake some task that a visitor has found difficult, generally through lack of equipment. It is the intention of the Enfield group to develop this service and they are prepared to accept machining work, at visitors' risk, during the period of the exhibition.

They will not be beyond rendering emergency repairs to the shoe or umbrella of a damsel in distress! Particulars of this service may be

Smoke Rings . . . Lights under bushels

obtained from Mr R. L. Lee at the Demonstration Area.

For the precision minded, Enfield Technical College will stage demonstrations, at frequent intervals, on the science of metrology, which requires the use of highly-specialised equipment, auto-collimators, slip gauges, thread measuring machines and optical projectors. Announcements of the times of these metrological demonstrations will be made on the public address system.

Transporting models

SHIP models are usually difficult subjects to pack for transport, and models of sailing ships are particularly troublesome. One of the most delicate models submitted in last year's exhibition, and the one which travelled the greatest distance, arrived safely without any packing at all; it was suspended literally in mid-air!

This was a dainty little model of an Admiral's barge for a naval three-decker. It was sent from Barcelona by Senor Francesco Roig, and was awarded a very highly commended diploma by the judges.

It was an open boat with thwarts. Four wire hooks were made to engage with the ends of the thwarts, and rubber bands from them were fastened to the top of the box, and held the boat suspended in mid-air. A further series of rubber bands attached to the bottom of the box was secured to the hooks, and thus the model was firmly but flexibly held—very much in the same way that the receiver is suspended in some radio controlled boats.

The stand for the model was fixed to the end of the case by wooden clamps. The front of the case hinged from one end; four studs with wing nuts secured it when closed. For greater security a hasp and padlock could have been used, but this would have involved sending the key separately. However, in this particular instance, nothing was interfered with.

Full instructions with a diagram were given on the inside lid of the box. A convenient handle was fitted so that the case could be carried the right way up. The photographs explain the method used.

The principle could be applied to any small model, or in fact to any light and delicate object, and it is well worthy of the consideration of our competitors when sending entries to the forthcoming exhibition.

MANY people who believe that model engineering is confined to a relatively small band of enthusiasts may be surprised to learn that there is scarcely any town or village in Great Britain where this pastime is not practised by at least one or two lone hands.

Quite apart from the large number of models which appear each year at the ME Exhibition, and at local club displays, there are still more which are built to blush unseen, by constructors who are too modest to display them in public. Some of these models are of outstanding merit, and it is a great pity that they cannot be winkled out of obscurity to give something like a true picture of the immense popularity of model engineering.

I have found good models, and collections of models, in the most unexpected places, including a clergyman's study, a hay loft on a farm, and the dusty shelves of a lawyer's office. In all cases the owners—mostly the

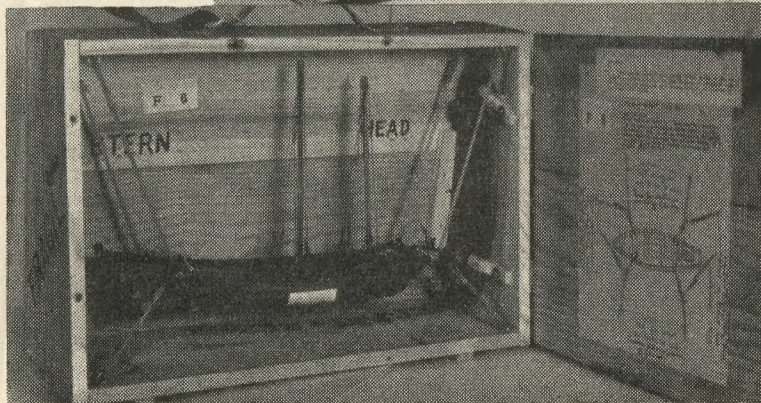
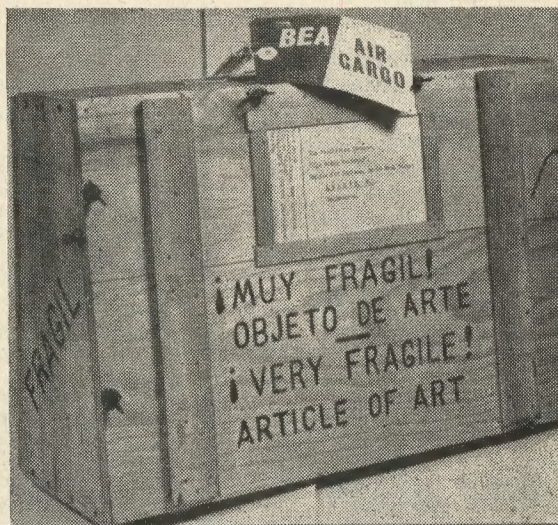
Cover picture

An artist's impression of a finished 60 c.c. gas engine adapted to run on petrol, paraffin or gas. The third instalment of the series on this engine by Edgar T. Westbury appears on pages 226 to 228.

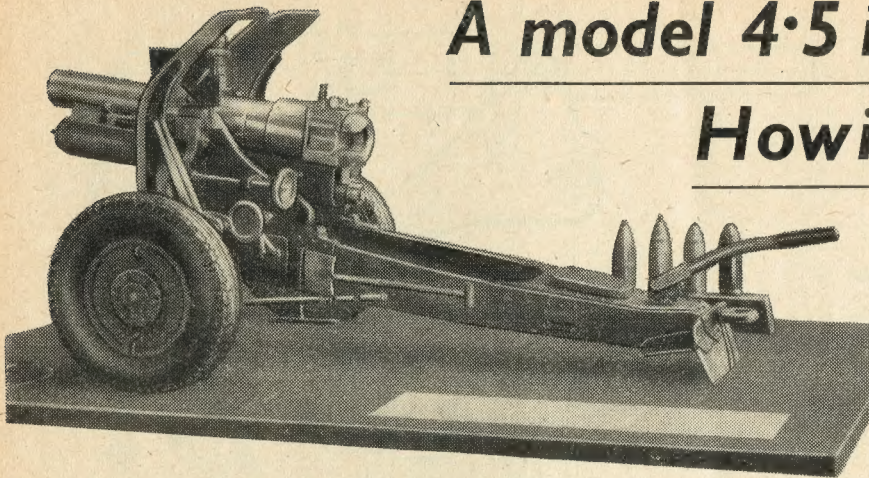
actual constructors—apologised for them and said they were “not good enough to put in an exhibition!”

To such I would say that there is no virtue in the concealment of a creative effort, whether it be a work of art or good honest workmanship. The precept “let your light so shine before men” is a practical one, and to hide it under the proverbial bushel is to deprive others not only of a merely interesting and pleasant sight but also of an example of patience and skill which they may be inspired to emulate.

The flexible mounting method of packing a fragile model used by Francesco Roig, of Barcelona



A model 4.5 in. Mk II Howitzer



This neat and compact model was made by S. A. WALTER

THIS weapon was used extensively on most British fronts during the 1939 war. It had several different mountings, and that illustrated is the Mk IPA carriage, with pneumatic tyres. As will be seen, it makes a well-balanced and unusual model, and well repays the effort in its manufacture.

It is interesting to compare the trend and progress in design between this and the 18 pdr gun (recently described in *MODEL ENGINEER*) during the period between the two world wars. The robust appearance of the howitzer gives a vivid impression of strength and power that is quite lacking in the 18 pdr, although the

latter, in its time, gave excellent service.

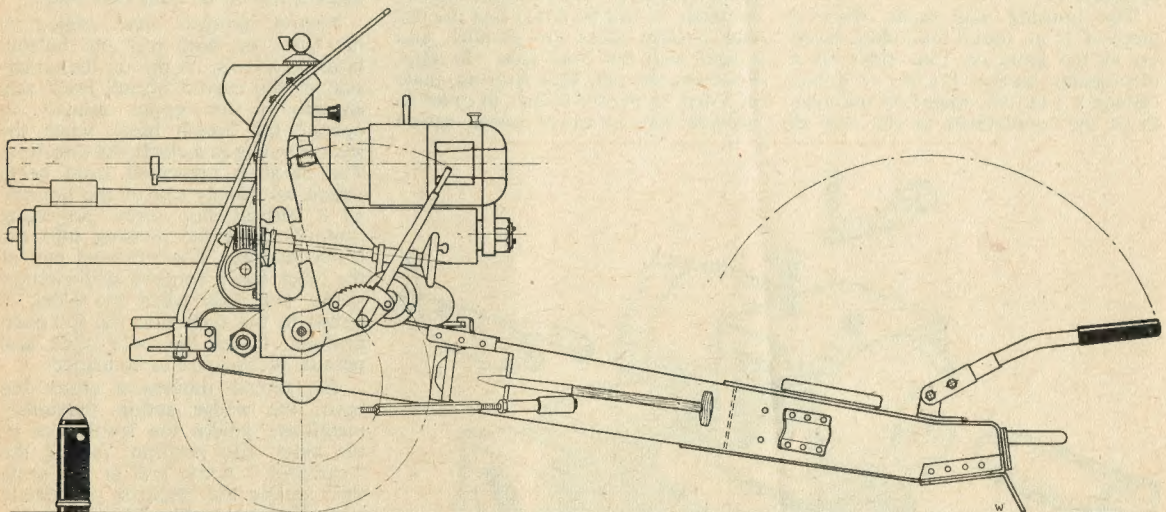
The breech mechanism on the howitzer is of the single-motion sliding-block type—an interesting piece of construction. Elevation is effected by a worm gear and quadrants, and traverse is by screw and nut. A fixed shield is fitted, and a band brake used for each wheel. The barrel recoils on firing and then returns, by means of a recuperator system, in the usual way.

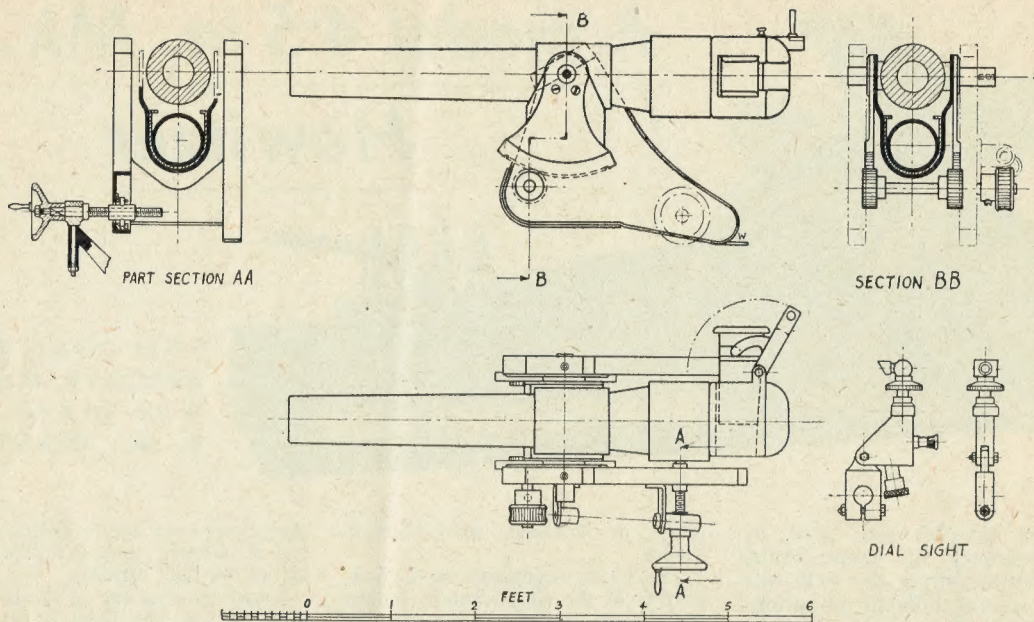
The scale of the model shown is one-tenth full size, the barrel being made from a piece of an old 0.450 in. bore elephant gun barrel which was inscribed *Henry's patent rifling*. This turned nicely to a good finish, and the enlarged portion at the breech was made by pressing a $1\frac{1}{8}$ in. dia.

short steel bush over a spigot at the end of the barrel, pinning it in position before the final turning.

Under the fore end of the barrel a steel pad, in the form of a small saddle, is attached by two 8 BA countersunk screws. The base of this pad is slotted on each side to fit the recoil slides on the U-shaped trough which houses the recuperator cylinder; it acts as a slipper guide for the front of the barrel. Trunnions are fitted about halfway along the trough-shaped housing by means of a sheet steel saddle; the left-hand trunnion is extended to carry the sighting gear.

The recuperator or buffer cylinder accommodates a spring-loaded piston and piston rod, the latter passing through a brass gland at the rear.





(Note that the steel securing nut at the end of the piston rod is octagonal, not hexagonal.) In the prototype the recuperator is operated by a powerful compression spring, inside of which an oil-filled buffer cylinder, enclosing a piston fitted with a retarding valve, absorbs the recoil. Because of the small space available, a single spring serves both purposes in the model. At the end of the trough is a vertical steel link, the upper part of which is attached to the breech housing. A plug closes the fore end of the buffer cylinder.

The housing was made from a piece of $1\frac{3}{8}$ in. round mild steel, faced up in the lathe on four sides to a rectangular section ($1\frac{1}{8}$ in. \times $\frac{3}{4}$ in.), leaving a $\frac{3}{4}$ in. dia. spigot on one face to fit the counterbore at the rear of

the gun barrel. A $\frac{7}{16}$ in. hole was then bored across the block between the two larger surfaces, through the centre of the spigot. The housing is screwed to the barrel by two screws on the underside.

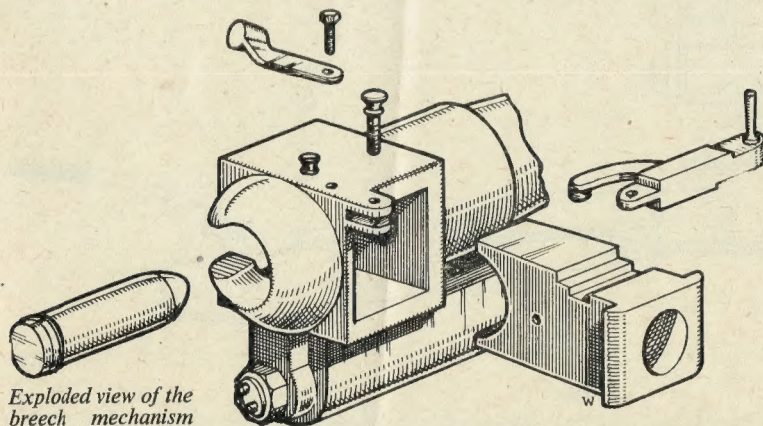
The outline of the rectangular hole for the slide was scribed on each end of the housing, and a small hole drilled right through in each corner. It was then bored longitudinally as large as possible to remove the bulk of metal, and some careful work with a square file produced the rectangular section required—an excellent exercise in filing. It will be noted that the top and bottom faces are parallel, and square with the front face. In plan, however, the rear face is at an angle of 3 deg. to the front face, in order to provide the necessary wedge action

when the breech block is inserted from the right-hand side.

This completed, the next step was to make the breech block, which was rough machined to suit the hole in the housing and then filed up to a nice sliding fit. It is worth while making a good job of this, as it is important that the mechanism should slide easily, but without play or rock. Constant filing and scraping, with the aid of a little "raddle" (a mixture of red lead and oil smeared thinly on the faces to indicate the high spots), enables this to be done effectively.

Narrow grooves were milled in the block on both top and bottom faces, as shown. A pin on the underside of the curved breech lever arm engages in the upper groove, to operate the breech block when the lever is swung in a clockwise direction. The block is prevented from being pulled completely out of the housing by a vertical stop screw projecting upwards from the housing into the lower groove. The left-hand end of the block has a concave semi-circular shape, and this, when the block is pulled to the right into the full-open position, leaves the bore clear and permits the weapon to be loaded.

The reverse movement closes the bore; the wedge action previously mentioned guides the front face of the block into position, forcing the "cartridge" home and at the same time sealing the chamber completely and effectively. The block is automatically locked by the breech lever when in this position. The firing lever is pivoted on the top of the



Exploded view of the breech mechanism

A model 4.5 in.

Mk II

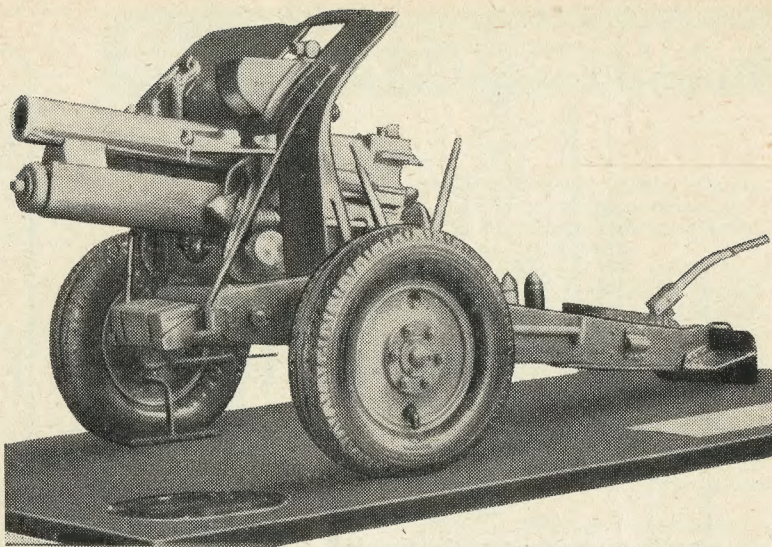
Howitzer . . .

breech housing and is, of course, only a dummy.

The carriage cheeks are triangular in shape, flanged all round the rim, and are connected by a curved transom. A pivot through the base of the latter also passes through another transom on the top of the trail to provide the traversing movement. At the rear end of each carriage cheek a flat steel tongue is riveted; this slides in a fork-shaped fitting on each side of the trail and prevents the carriage lifting when the gun is discharged. The trunnion bearings and cap-squares are situated at the apex of the cheeks, and lie at an angle of 30 deg.

The traversing motion is actuated by a hand wheel and spindle located below the elevating gear, working in a swivel bearing on a bracket riveted to the side of the trail. The spindle is threaded 6 BA, and passes through a sleeve nut swivelling on the inside of the left-hand carriage cheek.

On the left-hand side of the gun, supported in two brackets riveted to the carriage cheek, is the inclined elevating shaft operated by a bronze

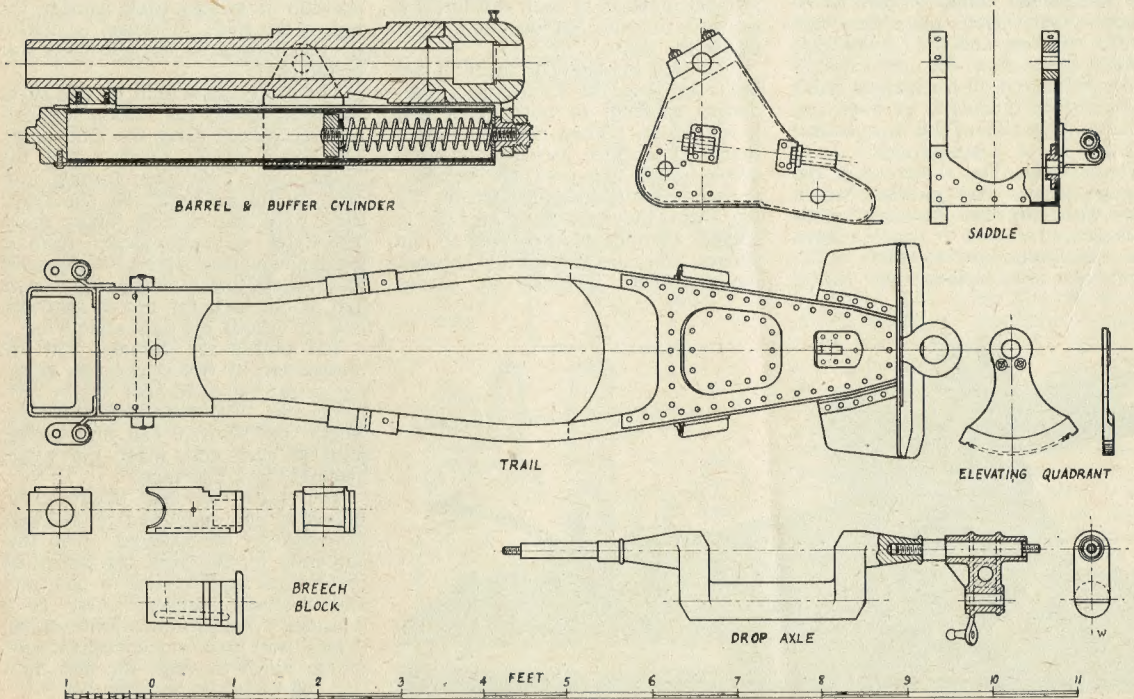


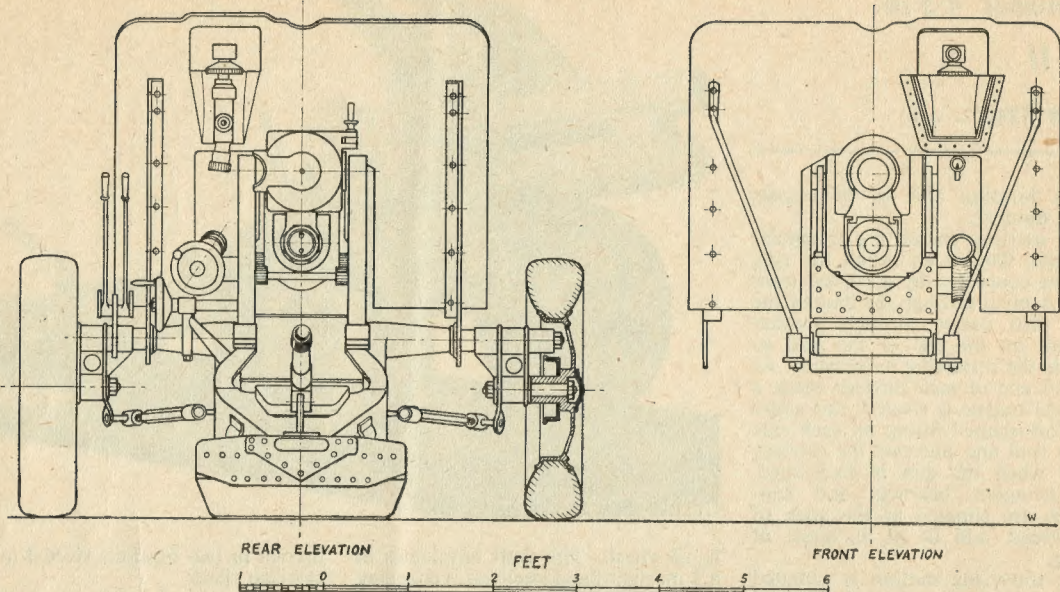
hand wheel. The shaft terminates in a $\frac{3}{8}$ in. right-hand steel worm engaging with a worm wheel.

The worm was made by screwing a length of suitable rod $\frac{3}{8}$ in. Whit. in the vice (my lathe is non-screwcutting) afterwards turning the shank down to size between centres. By cutting the thread first, it enabled the rod to be centred correctly and ensured a smooth and easy drive. The rear end of the shaft was filed square to suit the hole in the hand wheel, and it is

carried in two brackets riveted to the carriage cheek.

A bronze blank for the worm wheel was roughed out $\frac{3}{8}$ in. dia., and a groove about $\frac{3}{16}$ in. radius turned in the rim. A $\frac{1}{8}$ in. vertical peg was driven into a piece of $\frac{1}{2}$ in. square bar clamped in the tool-post. The blank, free to revolve on the peg, was packed up so that the groove was at centre height, and a $\frac{3}{8}$ in. Whit. plug tap was mounted between centres. With the lathe at its slowest speed, and the





use of plenty of lubricant, the top slide was advanced so that the full depth of cut was taken immediately.

This is important, because if the blank is fed slowly, an imperfect thread results; the thread is shallow and only about half the normal pitch, owing to the fact that the tap does not pick up the thread properly at the end of the first revolution. The size of the blank appears to be unimportant; various diameters were tried at random, and the results were good in every case. (A useful hint is to use an animal oil for a clean finish when cutting threads.) A boss was turned on one side of the worm wheel and tapped for a grub screw.

The cross-shaft at the front of the carriage carries two pinions, which mesh with two steel elevating quadrants secured on, and to, the trunnions. The quadrants, or elevating arcs, were made by turning steel discs,

and are $\frac{3}{16}$ in. thick at the rim. An old brass clock wheel from the junk department (a box under the bench), which meshed with the pinions was temporarily attached to the disc by two screws; using this as a template, the teeth were carefully filed in. Afterwards the clock wheel was detached and the surplus metal on the disc was cut away, leaving a quadrant. A blank portion at each end forms a stop to prevent the quadrant over-riding the gears.

The side brackets of the trail are built up from 18 s.w.g. plate, with flanges soldered to both upper and lower edges. They were curved to shape by a little judicious manipulation in the vice jaws, an operation they stood very good-temperedly. At the front they are connected by a curved wrapper plate riveted to the flanges, and a tie bolt is fitted between the two sides. The rear end carries

the trail eye and spade, and top and bottom plates are riveted in position to the side flanges, forming the trail box.

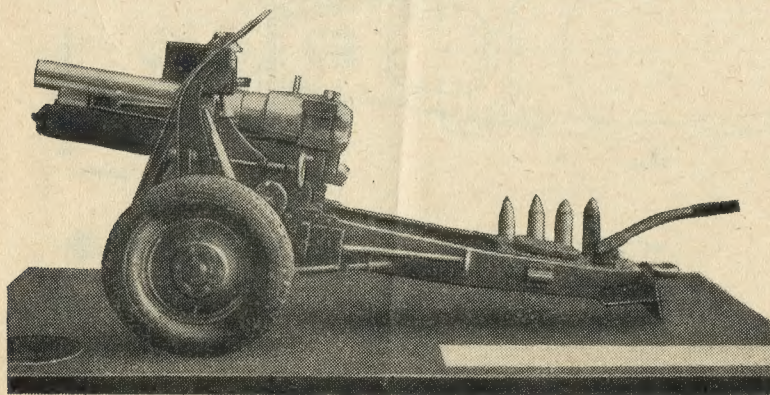
A vertical partition between the two plates forms the front end of this box, the cover of which can be seen on top. The steel hand-traversing lever is fitted immediately to the rear of the cover; when in the travelling position it swings back against the top of the trail. A shovel is carried on the outside of the left-hand side of the trail.

The drop axle is built up and silver soldered from bar, and supports brackets which carry the stub axles. The wheel centres, together with the brake drums, are plain turning jobs and call for no particular comment; they were made from brass discs. The tyres were purchased from a well-known chain store. Fitted round glass dishes, they were sold some years ago at 6d. each for use as ashtrays, and are exactly the right scale size.

The brakes are dummy, and are represented by two steel levers working in ratchet quadrants on the left-hand side. Tie rods, adjustable for length and with a ball and socket joint at each end, make the whole assembly firm and taut.

The shield is bent from plate, bolted to and supported by brackets mounted on the axletree. The two stay-rods in the front are anchored in brackets at the front of the trail, and mounted between these is a "leather" toolcase, bound with straps. A large port is cut in the left-hand side of the shield to allow the dial sight

● Continued on page 248



BALL JOINTS

By GEOMETER

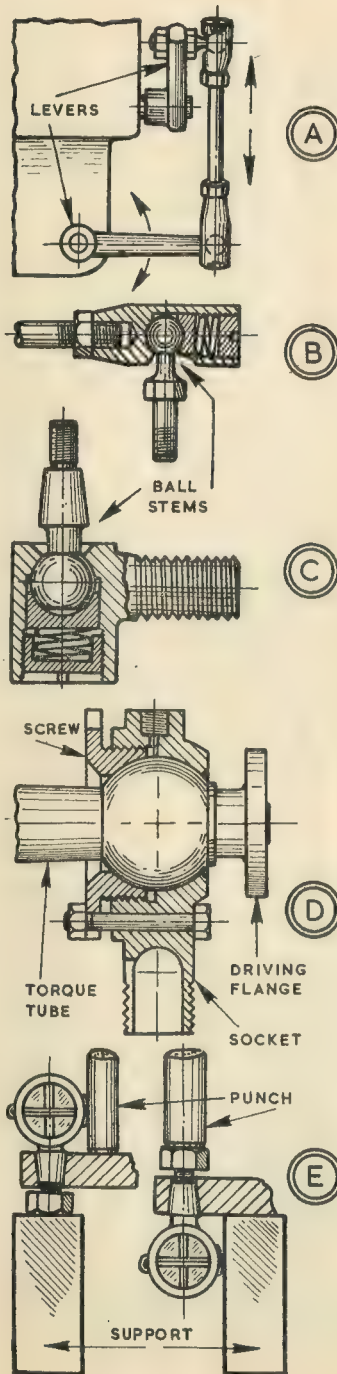
THE particular value of a ball joint in mechanisms is that, unlike a hinge or pin joint which constrains movement to a given plane, movement in any direction within set limits is possible. A ball joint may be likened to the shoulder joint of a person, permitting the whole arm to be raised or lowered, directed forwards or backwards, and the hand to be swung in circles of varying size; whereas, the elbow joint, a hinge type, has a much more limited movement.

A ball joint can be utilised broadly in three ways in mechanisms, to provide—(1) directional setting with clamping, as on swivelling vices or the heads of camera tripods; (2) location at a fixed point for an arm or link, the movement of whose opposite end must not be constrained to a single plane, examples being torque tubes of rear axles on cars like old type Austin Sevens and Ford Populars; (3) connections between levers swinging in different planes, as on throttle and steering linkages on cars, on the principle shown at *A*.

Three conditions

The first consideration for a ball joint is that on its functional surfaces the ball must be a reasonable "sphere," since in the absence of this there is certain to be a "tight and loose" effect, reducing the efficiency of the joint whether it is employed for clamping or locating, or for transmitting movement. Secondly, the cups or containing surfaces must agree sufficiently well with the ball to avoid rapid initial wear and bedding down. Thirdly, when the connection is between two

BEGINNER'S WORKSHOP



levers, the bodies or housings forming the cups must be appropriately set to eliminate binding or cutting on the ball stems at all positions.

Thus, however, the levers at *A* may be moved, it should be possible to twist the rod connecting them to and fro to a small extent. This requires the ends to be set at suitable angles by the locknuts. It is important in the case of throttle linkages to obviate jerky movement—or in some instances the joints springing off; while on steering linkages it is vital that the ball stems should not be cut and weakened.

Without affecting the principle, a ball joint for a linkage can be arranged as at *B* and *C*. At *B*, the ball passes through an elongated hole in the side of the body; and at *C*, the ball stem itself is passed through the body. In each joint, one cup is formed in the body, and the other is held up by a spring, which is backed by a cap that can be adjusted with a screwdriver and secured by a split pin.

Automatic adjustment

Provision of spring loading for one of the cups ensures automatic adjustment for wear and maintains the joint tight without binding in the event of a ball not being perfectly spherical. Where there are heavy thrust loads, as on steering mechanisms, the joint at *C* keeps deflections in both directions to a minimum, for neither way is there a direct push on the spring loaded cup as occurs at *B*. For light loads, ball stems are made with parallel shanks, but for heavy duty the shanks are tapered to fit in arms.

The torque tube joint of the Austin Seven, an example of a specialised ball joint, is as at *D*. The ball is part of the tube and the large diameter screw has a serrated flange, locked by a bolt passing through. The socket is located on a chassis cross member by a small ball joint. To adjust the joint, the bolt is removed, and the screw tightened by levering or punching on the flange. Free movement should obtain without play. All adjustment being taken up, some extra can be provided by facing the front of the socket and deepening the recess in a lathe, to allow the screw to go further in.

Freeing of taper ball stems can be effected as at *E*, supporting either the nut or the arm on a block or jack, and punching the other down. ■

What to see at the . . .

ME EXHIBITION

MARINE SECTION

POWER-DRIVEN models of prototype vessels are not very numerous according to the entries received at the time of writing, and engine-room installations are less interesting than they have been in some previous Exhibitions. Electric propulsion is favoured in most cases, the only exceptions being one steam-driven and one petrol-driven boat.

B. P. Webb, a clerk, of Highgate, North London, has entered two models, namely a 1 in. scale model of an RAF range safety launch, with full interior detail, and a $\frac{3}{16}$ in. scale model of an ocean-going tug. Both are electrically propelled, and this applies also to the model of a 52 ft Barnet Stromness lifeboat by T. E. Nicholson of Great Yarmouth, which is built to approximately $\frac{3}{4}$ in. scale, also the West Highland Steam Coaster, or "Clyde Puffer" by W. A. Brewer, a taxi driver, of Greenwich, which is in $\frac{3}{8}$ in. scale.

The 1/20 scale model of a sea-going steam tug by Charles Blazdell, an engineering draughtsman, of Norton, in Gloucestershire, is based mainly on designs published in the ME. It is 5 ft in length \times 15 in.

beam and weighs 106 lb.; the hull is built from brass sheet, the plates being of 22 gauge, and over 1,000 $\frac{1}{16}$ in. rivets are used in its construction. Power plant consists of a triple-expansion engine and boiler, and auxiliaries include a separate steam feed pump, working steam, windlass and electric steering gear.

Entered jointly by R. Chamberlain, a fruiterer, and B. Stallworthy, a Post Office engineer, both of South London Ship Model Society, the radio-controlled cabin cruiser *Sirius Star* is powered by an o.h.v. twin 40 c.c. water-cooled petrol engine. The radio system operates on an ordinary unmodulated single channel, and provides 12 separate controls, including engine self-starter, speed, and reversing gear.

Non-working models of steam and motor ships: a 33 in. model of H.M. Yacht *Britannia* by Lester F. Wade, a joiner, of Hornsey, North London; a 3 ft model of a *Larne* class destroyer by E. Maynard, a commercial artist, of Hove; a 16 in. model of the paddle steamer *Royal Eagle* by T. P. Sturdee, a retired engineer, of Thames Ditton, Surrey; and a $\frac{1}{16}$ in. scale model of the steam packet *Banshee* by J. L. Hamilton-Patterson, a medical practitioner, of Edgware, Middlesex.

In Class F, L. Gough, of South

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
★ Second in this series of three ★
★ articles highlighting some ★
★ of the models which will be ★
★ seen at this year's show ★
★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

London, has built a $\frac{1}{4}$ -in. scale model of HMS *Prince* of 1670, using plans obtained from Percival Marshall and Co. Ltd, and some photographs obtained from the Science Museum. Historical models of this kind are always interesting and, in time, become valuable if they are accurate. Mr Gough's model has a plank-on-frame hull and is not rigged.

Another type of ship that has now become historical is the Thames Bawley, and it is a prototype that appeals to many model makers; fortunately a few can still be seen, though rarely, in the Thames Estuary, engaged in either shrimping or cockling. D. B. Sanglier, of Birmingham, is exhibiting a model built to the unusual scale of 17/37 of an inch to the foot, according to entry form. That may cause some discussion!

Another oldtimer has been chosen by F. A. A. Pariser, of Kidderminster, as the prototype for a $\frac{1}{4}$ -in. scale model of the frigate *La Licorne*. He has worked to original Admiralty drawings obtained from the National Maritime Museum.

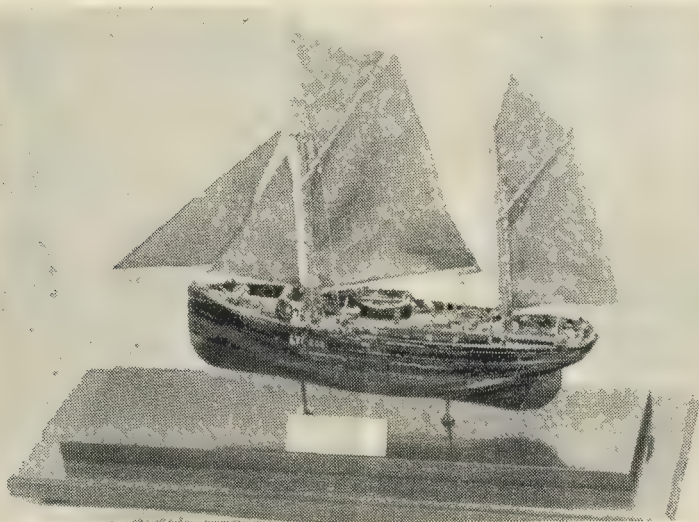
A. E. Field, of Streetley, Staffs, has submitted a scenic model of a Severn-side quay of the late 18th century. It is a fairly large model measuring about 4 ft long \times 2 ft 6 in. high \times 2 ft 3 in. wide, and includes some of the old Severn trows; it provides an attractive spectacle.

Capt. John W. Moroney, of the United States Air Force, seems to have been occupying his spare time in making a $\frac{1}{4}$ -in. scale model of the brigantine *Leon* from Underhill plans. The model is completely rigged, work which can often give plenty of scope for ingenuity, and should be well worth close scrutiny.

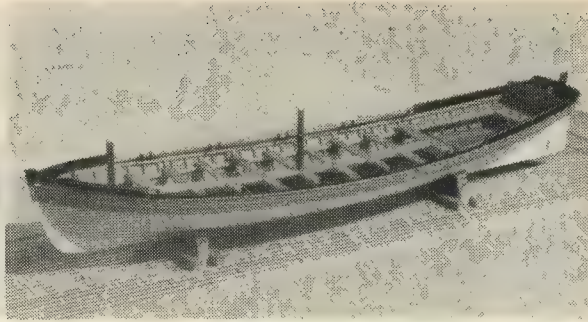
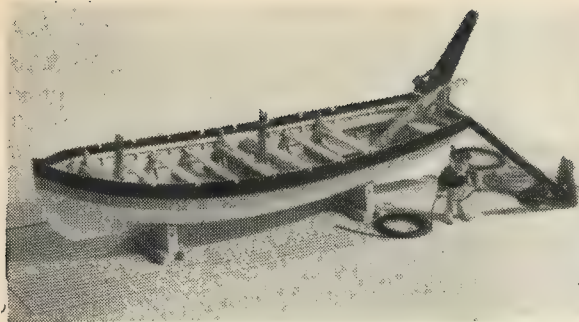
A touch of Far Eastern quaintness is suggested by a $\frac{1}{4}$ -in. scale model of a Chinese river junk, made by J. Hardy, of Kings Langley. It is a sailing model with single mast, balanced lugsail in three sections, and typical bamboo battens. It was made from pictures published in a magazine 20 years ago.

A ten-rater model yacht, *Laughing Water*, built by C. J. Buckman, of Welling, is equipped with a new type self-tacking vane steering gear which has proved very successful in action.

A recent tendency in the marine section has been a considerable increase in the number of miniatures,



The Lowestoft trawler MASTER HAND by E. Baynes Rock



Three contributions by G. H. Draper. Above: a miniature barge and launch and, right, a cutter built to $\frac{1}{4}$ in. scale



and this year appears to be no exception, judging by the number of entries received. They are always wonderfully varied and attract much attention from visitors; many of them can be described as pictures in the solid, especially when the models are mounted in a sea setting.

P. M. Baggaley, of Croydon, is exhibiting a waterline model of the United States Navy's light cruiser *Huntington* made to the scale of 115 ft to the in. from plans in *Jane's Fighting Ships*, and without any workshop facilities. The model is $5\frac{1}{2}$ in. long, $\frac{1}{2}$ in. wide and 2 in. high.

A glimpse of the future is seen in a miniature made by C. F. Worker, of Belmont. It represents, to the scale of 100 ft to the in., the liner *Oriana*, which is being built by Vickers-Armstrongs Ltd, at Barrow. The prototype will be a 40,000-ton ship, the largest built in this country since the *Queen Elizabeth*, and is due for service in 1960; she will be owned by the Orient Line and will sail to Australia and the Pacific.

D. G. West, of South London, exhibits a model of the cargo vessel *Caledonian Monarch* sailing in a moderate sea and stiff breeze. The model represents a typical cargo vessel of the 1920-39 period, and is made to the scale of 32 ft to the in.

A favourite vessel is represented by a 40 ft to the in. scale model of the Bergen Line's well-known motor ship *Venus*, made by J. T. King, of Thornton Heath, using plans published in 1948.

The model is 15 in. long and was

"built on the dining room table."

An entry of more than ordinary interest comes from E. B. Rock, of Bexhill, who is 88 years of age. It represents a Lowestoft sailing trawler to the scale of $\frac{1}{8}$ in. to the ft, and is 10 in. long. It entailed more than 1,000 hours of work and is made of materials from the scrap box. Mr Rock made his own drills out of No 10 knitting needles, and the blocks were fashioned from plastic needles by means of a home-made jig.

A picture in the solid, entitled "Prepare to launch aircraft," in-

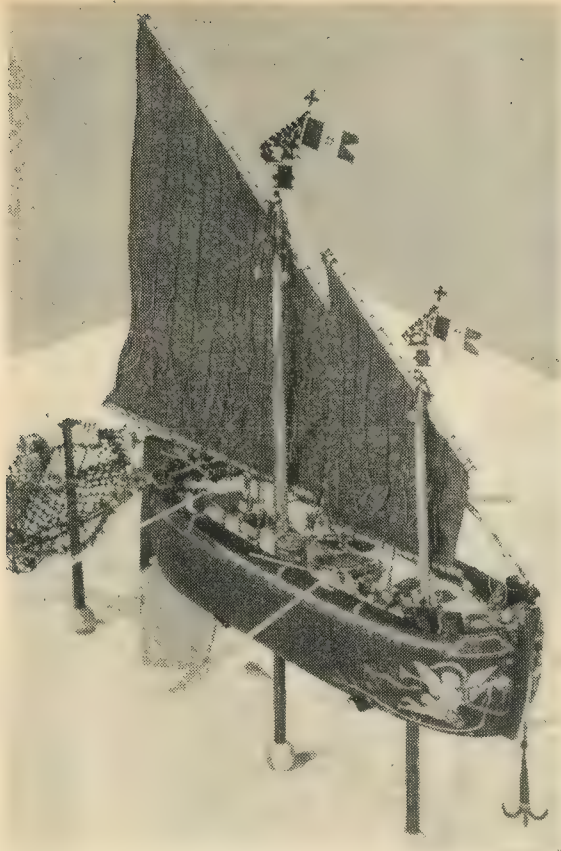
cludes models of the aircraft carrier *HMS Victorious* escorted by the Battle class destroyer *Barrosa*, all made out of balsa, paper, card, wire and pins, by M. J. Hard, of Southport. The sea is made from Polifilla, painted in water colours and varnished.

Another example of the same kind of thing comes from C. Seston, of Hanwell, whose effort, to the scale of 100 ft to 1 in., represents the liner *Empress of Canada* under way in a calm sea. It is its maker's first attempt in so small a scale; but he has also sent in another exhibit, this one to



D. Hunnisett's model of the ARCHIBALD RUSSELL

What to see at the ME EXHIBITION . . . continued



50 ft to 1 in. scale, representing HM minesweeper *Marvel* at anchor in a Plasticine sea.

A fully detailed model of the four-masted barque *Archibald Russell*, to 50 ft to the in., comes from D. Hunnisett, of Eastbourne. It is 5 4/5 in. long and represents the handsome vessel on a broad reach, in full sail, set in a carved wooden sea.

Decks and deck houses are planked; the wheel is 1/12 in. dia., built up in

wire; there are coiled ropes on belaying pins; running rigging is of Terylene cotton filaments, and the standing rigging is of wire.

LOAN SECTION

In the Loan section, there are some very interesting locomotives.

First, as an indication of "things to come," two well-known manufacturers are lending official models; one is a 1/2 in. scale model of a 400 h.p.

diesel-electric locomotive by the Yorkshire Engine Co. Ltd, of Sheffield, while the other is a 1 in. scale model of a 200/300 h.p. diesel-hydraulic shunting engine by the North British Locomotive Co. Ltd, of Glasgow. Both these, externally, are exact reproductions of their prototypes.

A 16-year-old apprentice, R. E. West, of Bletchley, Buckinghamshire, is building a 1/2 in. scale 2-6-0 tender engine, which is shown in its, as yet, unfinished state. Although it does not qualify at present for entry in the Competition section, this engine may well be all the more interesting on account of its incomplete condition.

A model that is very much out of the ordinary is C. M. Keiller's 2 1/2 in. gauge LNWR four-cylinder compound of the Jubilee class in course of construction. This engine is practically a scale replica of the prototype and, so far as is known, is the first amateur-built example of a small-scale version of this class.

In its present condition, the model is well worth the closest examination because so many of its features are



Above: "Ferry Ahoy." A Thames wherry, scale 1/2 in. to 1 ft, modelled by E. C. Freeston

Left: Miniature by H. Chauvaux, of an Italian fishing boat

Two views of D. A. S. Hughes' miniature B.I. liner KENYA



uncommon and are sufficiently exposed to be studied in detail; moreover, the workmanship is exemplary and should be duly noted, especially by novices.

STUDENTS' CUP COMPETITION

Evidence of increasing interest in model engineering in schools and training establishments is shown by the large number of entries in this class; moreover, they are more widely varied than they have been in some previous exhibitions, and there is a welcome tendency to get away from the stereotyped—and often uninteresting—"test jobs" which have sometimes been predominant.

Two team entries are submitted by the technical department of Rayleigh County Secondary School—namely a horizontal double-acting mill engine, built in the course of a year's work by four 5th-year pupils, and a single-cylinder oscillating steam engine built by four pupils during one term in their 4th year.

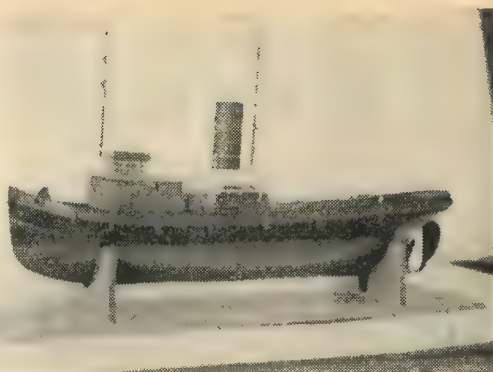
The Tylers Croft Boys' School at Kingsbury in North-west London also enter a team effort in the form of a group of engines, boilers and small machines, representing the work of 20 pupils. A number of individual entries have also been received from pupils at this school, including model steam engines, drilling machines and a small lathe of original design.

Other individual entries in this class include a scale model house and theatre, both equipped with electric lighting, by R. G. Conradi, of Hatch End, Middlesex; an electrically-driven 1/20 in. scale model of a luxury liner of the future, by Dennis Nash, of Southall, Middlesex; an anemometer, for measurement of wind velocity, by Robert Riley, of Clapham, South London; and a planimeter, for measurement of areas on charts or plans, by David Holt, of Hampton, Middlesex.

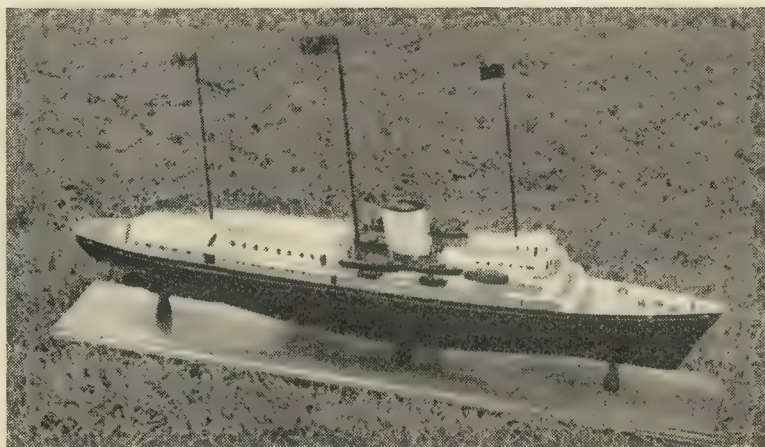
The last two items have been constructed in the workshops of the Northampton Secondary School, Clerkenwell, London.

● *To be concluded*

Right: An electrically-driven model of the steam tug S. T. GONDIA made by C. G. Wheeler



Below: Lester Wade's model of H.M. Yacht BRITANNIA



Right: Charles Blazdell's seagoing steam-tug ENERGY with, below, its working windlass, which has 1/4 in. bore x 3/8 in. stroke



A 60 c.c. HORIZONTAL GAS ENGINE—3

In this instalment EDGAR T. WESTBURY turns his attention to the cylinder, piston and connecting-rod

Continued from 1 August 1957, pages 148 to 150

REFERRING to methods of cylinder finishing, the only process normally available to the amateur and capable of producing the desired results is by lapping, though some constructors may have access to cylinder honing equipment. This enables the job to be done quicker, but not necessarily better.

It is by no means impossible in a cylinder of this size to finish the bore accurately enough direct from the tool, and there are many who consider that the use of abrasives in any shape or form is undesirable on the grounds that some traces of them are bound to be left behind, causing trouble, or at best, rapid wear. But it is by no means easy to produce a perfect tool finish by ordinary methods on a light lathe, and the bedding-down of a tool-finished bore, even though generally accurate, may be slow, and involve wear which results ultimately in excessive piston clearance and large ring gaps.

My usual method of lapping is to employ a split lap on a tapered mandrel with a nut on the end, so that it can be expanded to keep contact with the bore as wear takes place. Soft laps such as lead or copper are readily charged, and have a more

rapid action than harder materials. But the latter are easier to control, and I have obtained the best results with cast aluminium for coarse lapping (using carborundum) and cast iron for fine lapping (with aluminium oxide).

A lap about equal in length and diameter has been found best, and though it is possible to lap the cylinder bore while it is set up for machining, I have generally found it better to run the lap in the lathe and hold the liner by hand so that it is free of all chuck pressure; any local inaccuracy can be felt by the variation in friction.

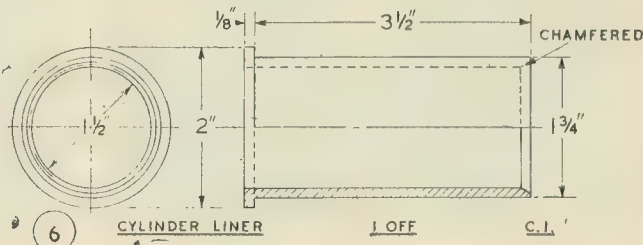
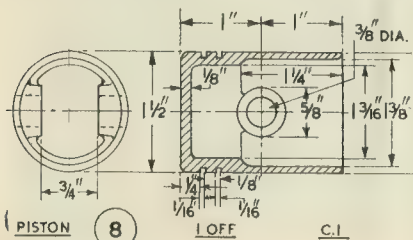
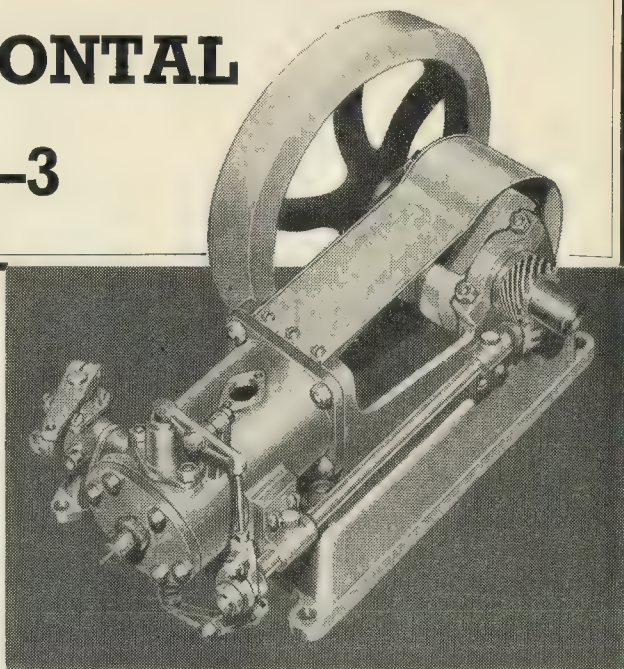
Spring laps of all kinds should be avoided, as they simply follow inaccuracies in the surface instead of correcting them. Some readers talk of "lapping" with emerycloth, but this can only polish out tool marks or surface scratches; similarly, the use of metal polish can only improve surface appearance because though most polishes act by abrasion, the

rate of metal removal is so infinitesimally small that it might be compared with an attempt to shovel away Mount Snowden with a teaspoon.

High polish is not the ultimate aim; a smooth uniform matt surface is far better—and will look better, too, after the engine has been run. Remember that the accuracy of the cylinder is a vital factor in the efficiency and reliability of any i.c. engine.

Although the cylinder head (part No 5) may seem at first sight to be a rather complicated component, it presents no special problems—either in casting or machining. The combustion head cavity and the water space can be cast without coring provided that normal taper or "draught" is allowed on the pattern, and although coring of the hole for the inlet valve housing and the gas passages is desirable, it is not absolutely essential.

I have often found it less trouble to machine these parts from solid metal



than to true up and clean out cored holes.

For facing and recessing the front of the casting, it may be held in the four-jaw chuck and set up as truly as possible over the outer diameter and face. The facing cut should be extended to clean up the faces of the rocker bosses, and the recess should be bored to a neat fit over the lip of the cylinder liner; its depth will depend on whether packings of any kind are to be fitted either on the inner (gas joint) face or outer (water joint) face. I favour metal-to-metal joints for the former, if not both, faces; it is true that gaskets of some kind are usual in full-size practice, but this is mainly because of the difficulty of maintaining accuracy of the faces under normal servicing conditions.

Many constructors will prefer to fit a thin gasket for the water joint, the inner spigot joint being lapped or "ground in." The depth of the recess can in this case be assessed by first finding the thickness of the jointing material (tough paper or tracing linen) when under compression, by gripping it fairly tightly between the contact faces of the micrometer—not tight enough to strain the instrument and thus impair its accuracy!—and boring the recess just this amount short of the depth of the lip on the liner.

This can be verified by assembling the liner, water jacket and head

temporarily and testing with a feeler gauge. Any correction necessary may be made by machining or lapping either the face of the head casting or the spigot of the liner, according to whether the gap is too small or too large.

In view of the importance of ensuring a tight cylinder head joint—allowing no leakage either of gas pressure or water—the time spent in these operations will not be wasted.

While the casting is set up for these operations, the bevelled mouth of the combustion chamber may be cleaned up, and it is also worth while to drill an undersize pilot hole right through the back end as a guide to setting up in the reverse position. As an ordinary centre drill will not reach the bottom of the cavity, a stiff spearpoint drill may be improvised from silver steel rod not less than $\frac{3}{8}$ in. dia. and used to start the hole exactly truly. The oblate cavity does not need to be machined but should be cleaned up with a riffler or rotary file when other operations have been completed.

After setting up in the reverse position, the water joint face and central spigot can be machined, and the centre hole drilled and tapped for the sparking plug. Note that either $\frac{3}{8}$ in., 10 mm., 12 mm. or 14 mm. plugs can be fitted as may be most convenient.

I recommend the smaller size; I have found it quite satisfactory in use and more in proportion to the

size of the engine than the larger plugs; the full-size 18 mm. plug is definitely too large for the combustion head. Either 12 or 14 mm. plugs will call for some enlargement of the centre spigot diameter, and the "reach" of any particular plug may be accommodated by adjusting the depth of the spigot so that the end face of the plug when fitted comes just about flush with the inside of the combustion cavity.

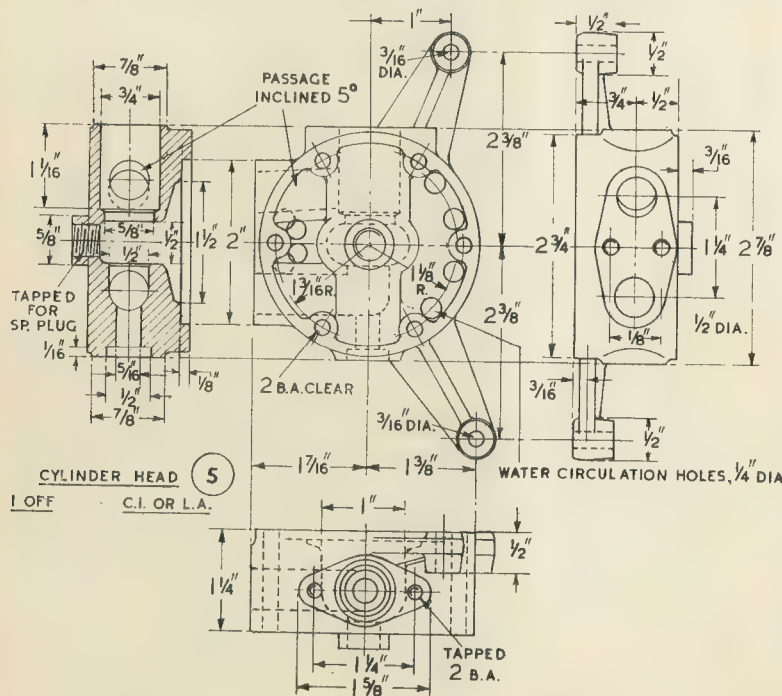
Operations at right angles to the main axis of the head can be carried out by mounting the casting on an angle plate, using either a strap with two bolts or separate clamps, not forgetting the sheet of paper under the machined surface. The use of a single bolt through the sparking plug hole is not practicable for dealing with the valve bores, which should both be machined at one setting if possible. It is not absolutely essential that the inlet and exhaust valves should be in perfect axial alignment, but what is important is the alignments between guide and seating of the individual valves.

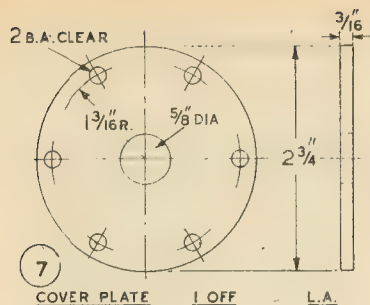
The bore for the inlet valve housing should first be machined by facing the top end and boring the two diameters, employing great care to ensure a smooth and accurate seating at an angle of about 120 deg. at the end of the larger bore. It is then necessary to centre-drill the inside of the cavity to start the drilling through the exhaust seating and guide; the spearpoint drill already mentioned can be used for this purpose but an even better plan would be to turn up a mild-steel pilot bar to fit exactly in the bore of the seating and mount a centre drill in the end of it.

If, however, any difficulty is experienced in getting the drill and counterboring cutter to run dead truly through the exhaust bore, the holes should be trued by means of a boring tool, even though they may have to be made oversize in doing so. The exhaust valve guide can, if necessary, be enlarged to fit, but the size allowable for the valve seating is limited by the fact that this valve can only be assembled by passing it down through the inlet bore. All this may sound rather difficult, but it is not so if reasonable care is taken; many readers have successfully constructed the ME Road Roller engine, which has a similar valve arrangement in a smaller size.

The counterbore on the underside of the exhaust valve guide can be carried out with a piloted cutter; it calls for no special accuracy so long as the recess is square with the bore axis, thus locating the guide in correct alignment.

By swinging the casting round on the angle plate at right angles, the





flat surface at the side can be faced, and it is as well to locate and bore the inlet and exhaust passages while mounted in this way. Note that the inlet passage must be inclined at 5 deg. to the horizontal; the exact angle is not critical but it is most important that the passage must emerge above the seating in the housing bore.

It is best to drill an undersize hole first, to see where it comes out, and, if necessary, correct the angle before enlarging the hole further. This passage also runs very close to the hole for one of the cylinder-head fixing studs, and though no great harm would be done if the latter should break in, it is best to avoid it if possible.

Holes must be drilled through the water joint faces of the cylinder head and jacket so as to line up and provide a passage for water circulation; these should provide as large an area as possible but some care will be necessary to avoid encroachment on port and passage positions.

On the gas passage side the holes will have to be drilled obliquely to dodge the passages and also the fixing stud boss; give this matter a little thought before going ahead, as it is easier to see what is required from the actual casting than to illustrate it in drawings or text.

COVER PLATE (Part No 7)

The cover plate is a very simple component which can be made either from a casting or sheet metal—though in the latter case, it is not advisable to rely on the initial surface being dead true; a facing cut should be taken over the inner joint face at least. The casting, of course, will need machining on both sides. Bore the centre hole to a snug fit on the spigot of the cylinder head in either case.

A thin joint may be fitted between the cover plate and the cylinder head, and a disc of the same material should be fitted on the centre spigot. As the function of the cover plate is merely to close the water space in the head, it is unlikely that it will

have to be removed again after once assembled. Thus if there should be any trace of water leakage around the centre spigot, it may be caulked or peaned over, taking care not to bruise the sparking-plug joint face; this measure, however, should not be necessary.

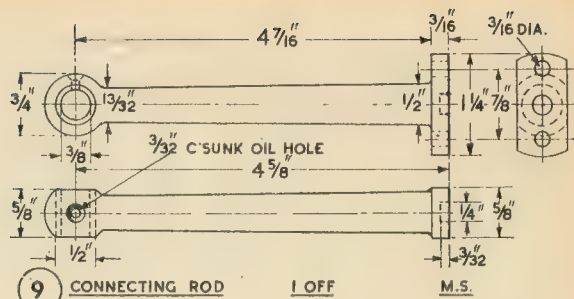
PISTON (Part No 8)

It is usual to provide a chucking piece on a piston casting so that it can be machined all over at one setting, but I find that this tends to encourage slovenly setting-up; only too often the rough chucking piece is simply gripped in the three-jaw chuck without due regard to whether the inside, which is the really important surface, is running truly. For this reason I often dispense with the chucking piece and hold the piston by the head end in the four-jaw, setting it up carefully so that the internal part is concentric throughout its length. The accessible part of the outside is then roughed out to a little over finished size, the end faced and the inside of the skirt skimmed out so that a true bore is produced at the mouth.

While in the chuck, the centre line of the cross-hole for the gudgeon pin can be marked out with a scribing block set to exact centre height on the bed of the lathe; this enables the position in relation to the internal bosses to be correctly adjusted. Lateral location of the pin can be marked by means of a point tool in the tool post; no harm is done if a fine groove is turned in the piston at this point.

The casting may now be mounted on an angle plate and set up on the face plate for drilling and boring the gudgeon pin hole. To ensure the hole passes diametrically through the piston centre, a line should be scribed squarely across the middle of the angle plate and the centre lines on the piston set to coincide with this both front and back before clamping it to the plate.

A reamer may be used for finishing the bore of the hole, but it should be left on the tight side for fitting the



gudgeon pin. Internal facing of the bosses is not necessary as floating clearance is allowed for the little end of the connecting rod.

Most of the excess metal on the head end of the piston may be machined away by holding it in the three-jaw, either before or after drilling the cross-hole, but for the finishing cut I recommend using a "spigot chuck," which I have described on several previous occasions. It consists simply of a disc held in the lathe chuck—or in any other convenient way—with a spigot turned on it to fit the inside of the piston skirt, and tapped in the centre to take an eye bolt.

A temporary gudgeon pin, well on the short side, is passed through the piston and the eye bolt, and this enables the piston to be drawn up tightly against the spigot, where it is free from any stress which might distort the external surface. The final machining of this surface and the turning of the ring grooves may now be carried out; take great care with the finish of the sides of the grooves, making the rings a free but not slack fit, and with ample clearance in the depth of the grooves.

For a cast-iron piston, a diametral clearance of about 0.001 in. per in. dia. in the bore of the cylinder is sufficient, with a little extra above the top ring. So for this engine, 1 1/2 to 2 thou will be in order.

CONNECTING-ROD (Part No 9)

The connecting-rod is turned from mild steel, though it is permissible to fabricate it by brazing on the foot—and also the little end boss, if desired. It is open to question, however, whether this method saves very much either in time or material, but if it is adopted I suggest that instead of building up fillets with the brazing metal, collars should be left on the ends of the rod and turned to form the fillets after brazing.

In this way the joints are almost invisible instead of being obtrusive, as they often are in such cases.

● To be continued

Forward to 1890 . . .

Sardonic, maybe. But this is what the 1956 Rating and Valuation Act has already meant to one society, as JOSEPH MARTIN well illustrates

How go the rates? This question, which has lain heavily on model engineering clubs in Great Britain since the 1956 Rating and Valuation Act came into effect, has not lost any of its topicality with the current proposal that fewer local charges shall in future be borne by the State.

If the new proposal issues into fact, the organised model engineering movement may look back on the 1956 Act with the wistfulness of old age pensioners recalling the days when beer was twopence a pint. Briefly, it is suggested that each area should be given a single grant to be spent on everything, instead of the present allotments for certain specified purposes. In addition, more will have to be found by the areas themselves.

Homeless Essex

Let us now see how some of the clubs are facing their present difficulties. First we have the Brentwood and District Model Engineering Society in Essex. With drastic simplicity, Brentwood has solved its rates problem by disposing altogether of the club premises. It now meets in members' homes, like the pioneers of the movement 50 or 60 years ago.

"This is quite practicable with a small club like ours," writes secretary J. J. Callaway (Woodside, Roundwood Avenue, Hutton, Essex). The society has in fact limited its membership for the time being to 25 partly because a large number would be inconvenient for the meetings.

Despite difficulties, the club has a full current programme and is sending its portable track to places as far from Brentwood, and from one another, as Saffron Walden and Bury St Edmunds. Nevertheless, one can hardly count it fair to any club that it should be driven back to the awkward pioneering days when the members met in private houses. The clubs were not founded without a struggle; they thrived on their own initiative, and a Government which professes to believe in initiative might be expected to help them forward rather than to turn them back along the road.

Late holidaymakers who enjoy the annual exhibition of Southport MEC next month may not realise the special

difficulties of its planning. The club's rates have *doubled* and the members, therefore, had no choice but to seek more modest premises. Those which they found, behind a grocer's shop near one end of Manning Street, would not accommodate their model railway in its old form. However, the Lancastrians refused to let lack of space cramp their style, and I am sure that the exhibition at Chapel Street Congregational Schoolroom from September 26 to 28 will have the success it deserves.

Ilford offer

Malden and District SME is another busy club and this year as in the past its hospitality will be enjoyed by visitors from the Model Engineer Exhibition. But it takes the subscriptions of 38 members to pay the rates on Malden's land and building for a single year. The increase in the rate has added very considerably to the total cost of running the society.

I am glad to know that clubs were able to use information in my March 7 article "The Key to Section Eight." Ilford and District Model Railway Club, after discussing the article at a meeting, is offering to co-operate with any interested club, without committing itself at present to providing funds for a test case. "If there is any question of arranging a meeting we should certainly be represented," says secretary R. L. Riddle (36 Vernon Road, Seven Kings, Essex).

What is Social Welfare?

Hitchin and District Model Engineering Club has been told by Mr Martin Maddan, its MP, that the Minister for Housing and Local Government does not consider it within his power to determine whether individual organisations come under Section Eight. Nor apparently does the Minister intend to define, as yet, exactly what he means by Social Welfare. The definition must wait until several decisions have been given in the courts, and then, presumably, the Minister will know what he means.

All suffering clubs will applaud G. J. Clark, the Hitchin secretary (35 Station Road, Lower Standon, Beds), for the following frank and amusing letter that he sent to Mr Maddan:

"You will doubtless appreciate that Mr Bevin's reply is a considerable disappointment to us and, in my personal opinion, very much evades the issue. I do not admit the Minister is incapable of making such a decision. I state that it is apparently only possible for the Act to be tested in the courts. This is quite a different matter and leaves the Minister free to repudiate the suggestion and correct my ignorance.

"Who in fact should be more capable than the Minister responsible for drafting the Act of determining, given a set of circumstances, that these do not fall within his intentions? Presumably, without sarcasm, you yourself are fully aware of exactly what your own recent Bill [a private Bill introduced by Mr Maddan] sets out to cover. Cannot the Minister display a similar ability?

Results

"We in fact asked for his interpretation—as opposed to counsel's, with which we cannot agree—of the essential words 'Social Welfare.' If, since our premises are not industrial, and yet are not domestic as we only dwell there for limited periods (my wife would dispute this) can the Minister deny that as a club headquarters used for non-profit-making recreation they exist for any other purpose than Social Welfare? Or can the Minister say why a bowling club, one of which to our knowledge qualifies for relief, fulfils the requirements more than model engineering?

"We should be grateful if at some convenient moment you could seek answers to these points. Or should we wait a few months and put them to Mr A. Bevan instead?"

Having sent off this letter—a pretty terrific one which well suggests the mood of the clubs—Hitchin turned its attention to the Valuation Officer. An earlier letter to Mr Maddan has already borne fruit, in that the club has been promised the 20 per cent relief next year. A further saving, if the Valuation Officer can be effectively prevailed upon, might bring the new figure close to the old.

Hitchin's example, therefore, proves that it is better to act than to wait. "Think not to move Camarina," said the ancients. But sometimes, with persistence, even the immovable can be shifted a little. ■



The restoration of *CUTTY SARK*



EDWARD BOWNESS brings to a close the
final chapter of this romantic story

FROM June 1954 onwards *Ships and Ship Models* published a series of reports on the restoration progress of *Cutty Sark*. These reports originated in a suggestion to the Editor by Frank G. G. Carr, chairman of the technical committee responsible for the restoration of the ship, that a series of photographs be taken illustrating the various stages

of the work with copies of such photographs going to the committee for use in their deliberations.

When I visited the clipper early in June I found that only a few finishing touches remained to be done. All the yards were crossed and the rigging was complete. The new figurehead was mounted, and the carvings on the trail boards and around the counter were in position and gilded.

It may be of interest to model yachtsmen that the figurehead was carved by Arthur Levison, who is well known as the builder of many of our finest model yachts. He is probably the only person in England alive who has worked on figureheads.

As a youth he worked with his father, who carved the figureheads of many sailing ships, his last being that for *Loch Broom*.

Leslie A. Wilcox, the marine artist and an expert on historical ships, co-operated with Mr Levison in blending the figure with the lines of the vessel, and to show the general swing of the figure and draperies he carved a lovely model, one-eighth the size of the actual figurehead.

The model, however, was not followed very closely, and the facial expression was modified to make it more witch-like. Whether Burns had this or a more fascinating type of witch in mind when he penned his immortal lines is a matter for conjecture. Albeit, the new figurehead is a fine piece of work, and much more worthy of the ship than the one it replaces, the head and outstretched



Two typical figureheads, one in natural colours and the other in the classical white

MODEL ENGINEER



Above: General view of the clipper with her first yard rigged in position

The delicate tracery of the rigging is a lovely sight as seen against the sky



arm of which were certainly not the original.

The decoration on the trail boards leading up to the figurehead was carved by Mr E. Wishaw, of Petworth, and that on the stern by Mr Thomas Turner, an employee of R. and H. Green and Silley Weir Ltd, under the supervision of their foreman joiner, Mr H. Young.

For the stern decoration a full sized mock-up of the counter was made; this ensured that the decoration would fit on the subtle curves of the ship. How well this has been done will be seen in the reproduced pictures which show also the figurehead and the graceful scroll work leading up to it.

There is a great impression of soaring masts and spreading yards about the clipper, and the stunsail

were even larger. *Preussen*, a five-masted full-rigged ship, had a gross tonnage of 5,081! How their enormous yards and heavy sails were handled by men with a minimum of mechanical assistance, save what could be obtained from blocks and tackles, will be a mystery to future generations accustomed to electric winches and modern gear.

In restoring the ship a new lower deck has been added—it is to accommodate the figureheads and other maritime relics which come from the collection presented by "Long John Silver," otherwise Mr Sidney Cumbers. This deck is somewhat shorter than the hull, and from it—especially at each end—the beautiful lines of the ship can be studied and appreciated, these being accentuated by the iron frames.

The collection of figureheads is interesting. Many come from small coasting schooners, but a number are from big sailing ships, some of which are of exceptional beauty. Most have been painted in natural colours though some look too bright and new. However, at least one of the larger ones is painted all white, the classical treatment for a clipper ship.

New deck houses

The new deck houses are fine examples of the ship carpenter's work. The main rail is interesting as reflecting the care which has been taken in the restoration of the ship. New pieces have been built in where necessary, and it now looks almost as good as when it was new.

There is a row of ports along each side at 'tween deck level. This, I understand, was necessary for ventilation and light, as otherwise an air-conditioning plant would have been necessary. It is to be hoped that future modellers will not be misled by this. (I have already seen a kit proudly displaying the ports as though they had been a permanent feature of the vessel.)

Offices for the administration of the ship have been built in the 'tween decks with provision for any classes or lectures which may be held there. Some of the bulkheads have been built to resemble the tea chests which formed the vessel's cargo in her early days.

The entry port has been made at 'tween deck level on the port side. At first objections were raised against cutting into the ship's side, and it was even suggested that the gangway should be taken over the rail to avoid cutting into the bulwarks. The arrangement adopted is by far the best solution, and is extremely convenient and not at all obtrusive in appearance.

The rigging is a delight to the eye:



The figurehead and decorated trail boards blend beautifully with the slender bows of the ship



The Queen in happy mood as she inspects the ship. On her right is Henry Barraclough, Esq., chairman of The Cutty Sark Society

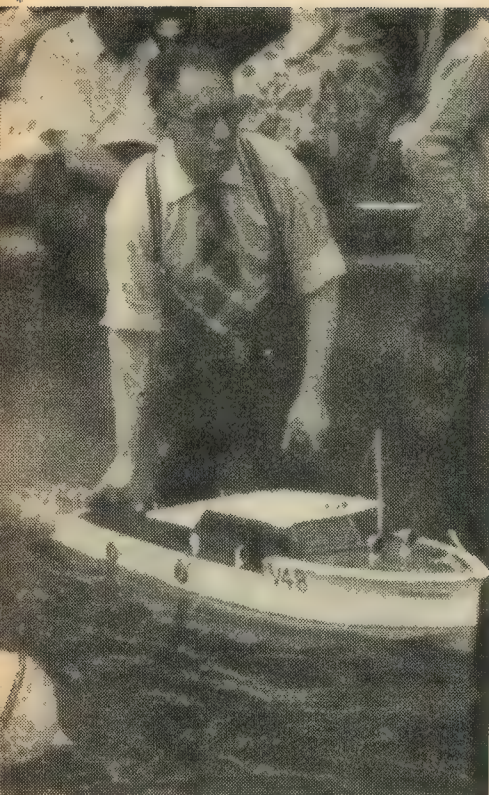
booms give a hint of the enormous spread of sail she carried, especially when considered in connection with such a slim, dainty hull.

Cutty Sark was by no means big as sailing ships go. Her 963 gross tons seems insignificant when compared with the 3,000 tons of the average four-mast barque of the 1890s, and the huge five-masters which followed in the next 20 years

all is so perfect and so well arranged. G. F. Campbell, whose ship models have occasionally been seen in ME Exhibitions, has been mainly responsible for its accuracy, and the LCC and the technical committee are to be congratulated on having had him available. And it cannot be over-emphasised that an accurate example of the rigging of that important period in the history of the sailing ship will be of the greatest value to model makers.

Altogether the restoration of the vessel has been well carried out; and the thanks of ship modellers everywhere are due to the *Cutty Sark* Society and its technical committee—and to the committee's chairman for his enthusiastic interest and inspiring leadership.

The opening of the clipper by the Queen was most appropriate. Prince Philip accompanied the Queen, and the Royal couple were obviously greatly interested. Prince Philip has been Patron of the scheme from its inception and has been a great influence in its successful accomplishment. The opening ceremony was a fitting climax to a great work. ■

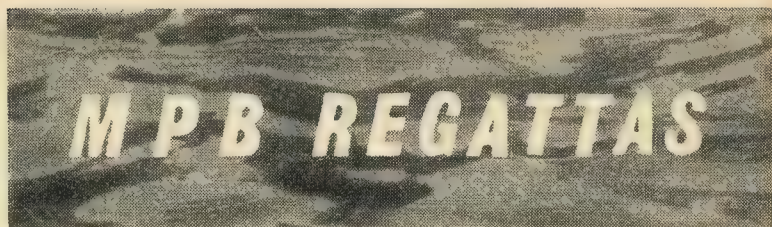


A. Newcombe (Victoria) with SILVER SPRAY at the start of the steering competition

Clark (Forest Gate) starts his petrol driven cruiser in the nomination race



MODEL ENGINEER



VICTORIA MSC

THE Victoria MSC is one of the oldest model power boat clubs in the country. Countless regattas have been staged at the Boating Lake in Victoria Park and this year's MPBA event attracted so large a number of straight-running craft that there was no time for a set lunch interval and the programme ran continuously from 11.30 a.m.

New boats

One of the most successful straight running exponents was R. O. Porter (Victoria), an enthusiast well known to ME readers. His boat *Slickery* came first in the nomination event and third in the steering. The home club also gained first place in the steering event, Mr Clark's launch scoring 11 points.

Barking MES had several new

boats in action, and the power boat section of this society is obviously on the upgrade. Many other clubs were also represented in the straight events, but the Victoria club took most of the honours as the results show.

Circular course racing is always handicapped at the Victoria Park Lake, as the water takes a long time to settle down after the straight-runners—not to mention all the waders!—have been in action. In spite of this some very creditable performances were achieved in the hydroplane events at the expense of several spectacular crashes.

Partly wrecked

Norman Hodge's new 30 c.c. job was partially wrecked in one of these mishaps and another sufferer was Frank Jutton, whose boat *Nike* took one or two dives.

An interesting new boat in class A was run by S. H. Clifford (St Albans). This boat is constructed from fibreglass and has a hull of pleasing shape. The run achieved in this class was the best so far, since teething troubles are only just beginning to be ironed out.



Townsend (Victoria) with a new 10 c.c. engine cruiser



R. O. Porter (Victoria) with SLICKERY in the steering competition



J. Rose (Bristol) with an interesting C class hydroplane



Colin Stanworth (Bournville) solves the problem of keeping cool!

RESULTS AT VICTORIA

80 yd Nomination Race

1. R. O. Porter (Victoria) *Slickery*, 0.9 per cent error.
2. T. Everitt (Victoria), 1.0 per cent error.
3. W. Morss (Victoria), *Edie*, 1.1 per cent error.

500 yd Class C Race

1. R. Phillips (St Albans), *Foz 2*, 64.13 m.p.h.

500 yd "C Restricted" Race

1. W. Everitt (Victoria), *Bill*, 57.46 m.p.h.
2. K. Hyder (St Albans), *Slipper 5*, 51.91 m.p.h.

Steering

1. — Clark (Victoria), *V42*, 11 points.
2. — Stevens (Bromley), *Lilena*, 10 points.
3. R. O. Porter (Victoria), *Slickery*, 9 points.

500 yd Class B Race

1. J. Skingley (Victoria), *V7*, 51.91 m.p.h.
2. F. Jutton (Aldershot), *Nike*, 45.2 m.p.h.

500 yd Class A Race

1. S. Clifford (St Albans), *Poly Ester*, 48.24 m.p.h.

BRISTOL SME

THE Bristol club has only recently acquired good facilities for running its boats and has not previously been able to obtain permission to hold a regatta. The club is now fortunate in finding a new water at Bitterwell Lake, Coalpit Heath, near Bristol. The lake is privately owned and situated in a pleasant spot with plenty of car parking space and refreshment facilities.

For running hydroplanes this water, set in a hollow, well protected from wind, and with negligible backwash, must be one of the best in the United Kingdom.

High speeds

It is not nearly so good for free-running boats since the water deepens rather rapidly towards the centre. For this reason the maiden regatta of the Bristol Club was restricted to hydroplanes.

As expected some very good speeds were achieved but two crack hydroplanes were suffering from mysterious engine troubles. Dick Phillips' *Foz 2* just achieved over 60 m.p.h. in its best run—a good run, but below the usual speed on such smooth water. On later runs the speed dropped, probably because the engine had tightened up somewhere.

Misbehaved

Frank Jutton's *Nike*, although this is only its second season, has already proved a strong challenger in class B. On this occasion it misbehaved peculiarly, failing to plane properly on any of the permitted runs.

On the other hand Ken Hyder's *Slipper 5* attained 69.57 m.p.h. and Colin Stanworth, with a McCoy engine fitted in his boat *Spur*, made the best speed so far attained by this new hydroplane. An Ensign-engined class C job by J. Rose (Bristol) also performed well and showed what one can do with a moderately ported engine.

RESULTS AT BRISTOL

500 yd Class A Race

1. J. Benson (Blackheath), *Orthon*, 56.19 m.p.h.

500 yd Class B Race

1. T. Dalziel (Birmingham), *Naiad 3*, 56.19 m.p.h.
2. F. Jutton (Aldershot), *Nike*, 36.4 m.p.h.

500 yd Class C Race

1. R. Phillips (St Albans), *Foz 2*, 62.2 m.p.h.
2. J. Rose (Bristol), 49.9 m.p.h.

500 yd "C Restricted" Race

1. K. Hyder (St Albans), *Slipper 5*, 69.57 m.p.h.
2. C. Stanworth (Bournville), *Spur*, 61.14 m.p.h.

SMALLEST GAS TURBINE ENGINE

SOLAR Aircraft Company of San Diego has designed the smallest gas turbine aircraft engine ever built. Only 20 in. high, with maximum diameter of 15½ in., and weighing only 50 lb., the tiny engine will produce 55 s.h.p. plus 12 lb. jet thrust. It will be used to power a one-man helicopter.

The company is to produce the new engine under a joint contract from the Navy Bureau of Aeronautics and the U.S. Army. Known as the Solar Mercury, the engine's military designation is the YT-62.

The new engine is the first to be designed and built by Solar specifically for aircraft propulsion. The Mercury will operate on standard military fuels, and the rotor will spin at 57,600 r.p.m.

ZOE

LBSC now goes on to give instructions for making the wheel-and-screw reverser gear and the steam and exhaust pipe connections between the cylinders

(Continued from 1 August 1957, pages 165 to 167)

As this locomotive is primarily intended for running on a continuous line on which the driver can "notch up" and get the utmost degree of expansion with resulting economy of steam, I am specifying a wheel-and-screw reverser. This allows of much finer adjustment of the valve gear than the notch positions of a "pole" lever.

The particular type of wheel-and-screw illustrated is similar to that which I specified for *Petrolea*, and is specially suitable for *Zoe* as it allows the reach rod to be fitted out of sight below the running board. And if anyone does prefer a push-and-pull lever, he could easily have one by substituting a notched quadrant for the screw and lengthening the rod to suit. It could be canted back to keep the top end clear of the boiler.

Alternatively, the rod could be made like a bell-crank, using a vertical quadrant like the handle that operates the steam reverser on my 2-6-6-4 American Mallet.

If a casting is available for the stand it will have the bosses cast on, and all it will need will be a clean-up with a file, and the bosses drilled for the screw. The front one is drilled $\frac{3}{16}$ in. clearing and tapped 7/32 in. \times 40, and a gland is made to fit from $\frac{5}{16}$ in. hexagon rod. This is necessary to allow the screw to be inserted. The gland is drilled No 30 to suit the end of the screw. To make certain that the holes in front and back line up poke the drill through the gland and drill the back boss with the gland guiding the drill.

To build up the stand cut a piece of 3/32 in. (13-gauge) steel plate to the shape shown. For the bosses chuck a piece of $\frac{5}{16}$ in. round rod (bronze or steel) face, centre, drill No 30 for about $\frac{1}{2}$ in. depth, and part off two $\frac{1}{16}$ in. slices.

Mill or file a groove in each and mount them on the ends of the stand, putting a piece of $\frac{1}{8}$ in. silver steel, which is usually straight, through the holes to line them up. Then braze them on if steel, or silver solder them if bronze. After cleaning up open out one of the bosses, tap it and fit a gland as described. Either cast or

built-up stand can be finished as below.

In the middle of the stand drill a No 48 hole and tap it 3/32 in. or 7 BA. In this fit a pin made from $\frac{1}{8}$ in. silver steel as shown, screwing it in tightly and riveting over the end of the screw. Drill four screwholes with No 41 drill at the position shown, and countersink them.

WHEEL AND SCREW

Chuck a piece of $\frac{3}{8}$ in. round steel in the three-jaw, face off, turn $\frac{1}{8}$ in. length to 5/64 in. dia. and screw 9 BA. File the next $\frac{1}{4}$ in. to a 3/32 in. square by the method I described for squaring the ends of valve pins.

Turn the next 7/32 in. to $\frac{1}{8}$ in. dia., then pull enough out of the chuck jaws to allow of about $\frac{7}{8}$ in. of $\frac{3}{16}$ in. Whitworth thread being put on it with the die in the tail-stock holder. Tighten the chuck well, and use plenty of cutting oil. Full-size screw reversers always have multiple-pitch threads for quick reversing, but the coarse pitch of the Whitworth thread will serve your purpose.

Part off at 1 $\frac{1}{8}$ in. from the start of the screwed portion, then reverse in the chuck and turn down the other end to $\frac{1}{8}$ in. dia., leaving the screw exactly $\frac{3}{4}$ in. long. Face the end off to leave the bearing $\frac{5}{16}$ in. long.

To make the wheel, chuck a piece

of $\frac{3}{4}$ in. rod (any metal you fancy; dural makes nice wheels), face the end, leaving a little boss in the middle, centre, drill No 42 for about $\frac{3}{16}$ in. depth, and part off a $\frac{1}{8}$ in. slice. Square the hole by driving a piece of 3/32 in. square silver steel through it, the steel being flat at the end and hardened and tempered to dark yellow.

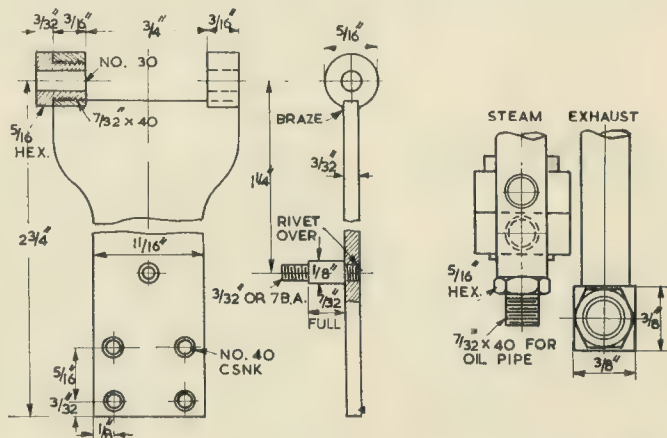
The spokes can be formed by drilling four holes in the web and filing them out to shape the four spokes. The grip is turned from a bit of $\frac{1}{8}$ in. nickel-bronze, and driven into a No 52 hole drilled in the rim, as shown in the section.

The nut is made from a bit of $\frac{3}{8}$ in. square bronze or gunmetal $\frac{7}{16}$ in. long. Drill the hole for the screw in the drilling machine or lathe, holding it in a machine vice, as it must go through dead square, then tap as shown. File the nut to shape, mill or file the groove exactly under the screwhole, then reduce the width to 9/32 in., which will allow for the exact amount of travel when erected.

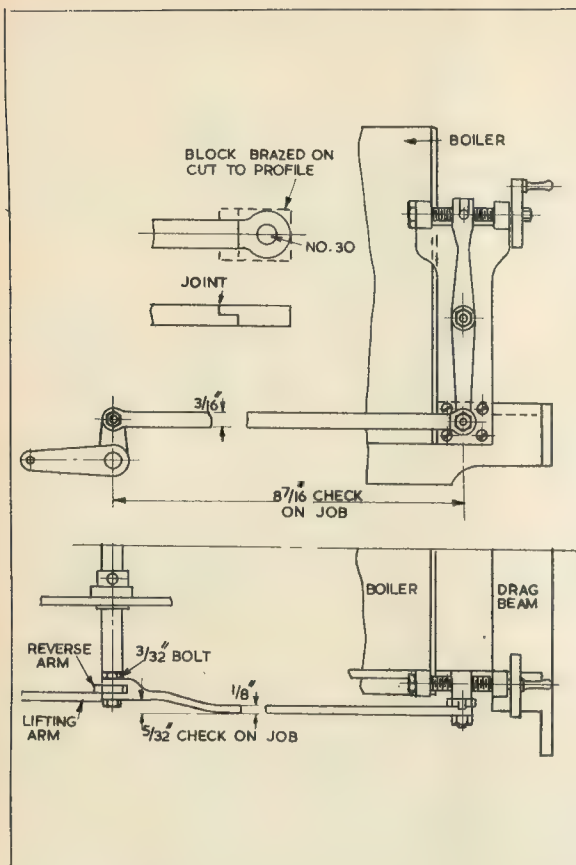
The pin which engages the lever is made from 3/32 in. silver steel screwed into the side (see section). Run the $\frac{3}{16}$ in. Whitworth tap through again after screwing the pin home, to remove any burring.

To assemble, take the gland out of the stand, put the nut on the stand with the groove over the top edge (mind you have the pin on the proper side of the stand, which is to your left when looking at the plain drilled end), insert the screw through the tapped bearing, squared end first, and screw it through the nut. Then push it right home through the drilled bearing, screw in the gland, and put on the hand wheel, securing it with a 9 BA commercial nut.

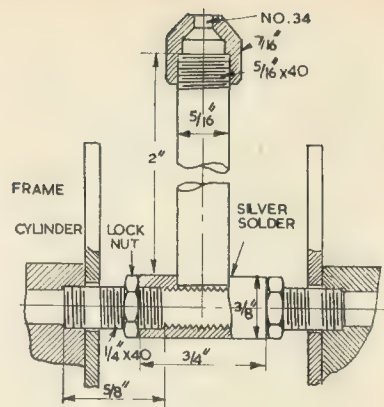
The screw should be free in the bearings with no appreciable end play,



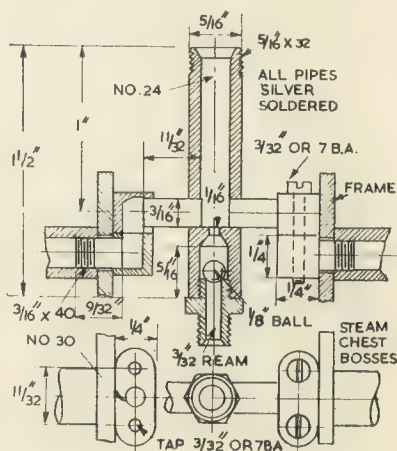
The reverser stand and side view of steam and exhaust connections



Left: Arrangement of the reversing gear and the wheel and screw



Right: Section through exhaust pipes



Right: Steam pipe assembly

and when the wheel is turned the nut should run up and down the screw with no tight places anywhere. If it is found to be tight, either the gland is nipping the end of the screw or the groove in the nut is bearing too hard on the top edge; remedies obvious!

HOW TO ERECT AND CONNECT

The lever is made from a $\frac{5}{16}$ in. strip of $\frac{3}{32}$ in. steel filed or milled to the dimensions given. Drill a $\frac{7}{32}$ in. hole in the middle, and in it fit a bronze bush turned from a bit of $\frac{5}{16}$ in. rod to the size shown. The bush should fit the pin in the stand without any shake.

At the bottom a $\frac{1}{8}$ in. silver-steel pin is fitted—in a similar manner to the one in the stand. The lever is fitted to the stand with the head of the bush next to the stand, which allows the upper end to bear against the nut; the pin should fit between the jaws without any shake. Put a steel washer between the lever and nut when fitting the lever to the stand.

To erect, line up the bottom of the stand with the end of the gap in the

cradle frame (see drawing showing the stand erected), clamp temporarily in position, run a No 41 drill through the cradle frame using the holes in the stand as guide, and secure with $\frac{3}{32}$ in. countersunk screws nutted inside the frame.

The reach rod is made from a piece of $\frac{1}{8}$ in. \times $\frac{3}{16}$ in. steel rod with little blocks of steel brazed on at each end to form the eye and fork. The piece at the eye end should be $\frac{1}{8}$ in. \times $\frac{1}{4}$ in. and at the fork end $\frac{1}{4}$ in. square.

The best way of making the joints is shown in the little inset. File a step in both pieces, butt them together, and braze. The joints are then cleaned, the eye and fork being machined as described for the eyes and forks in the valve gear.

The exact length of the reach rod between centres is obtained thus: put the valve gear in mid-position so that when the wheels are turned by hand, the radius rod does not move. Set the lever on the reverser exactly vertical, with the nut midway between the bearings. Then the distance from the middle of the pin at the bottom of the lever to the middle of the hole in the reverse arm is the exact length

of the reach rod between the centre of the eye and the pin holes in the fork. An ordinary nut secures the eye end, and a bolt made from a bit of $\frac{3}{32}$ in. silver steel screwed at each end and furnished with nuts does the needful at the forked end.

STEAM PIPE ASSEMBLY

The trouble with the plumbing job on this box of tricks is that there is darned little room in which to work! However, the drawing shows a fairly easy way of making and erecting the cross and vertical steam pipes and incorporating the check valve for the oil supply as well.

The first item consists of four flanges, which are made from pieces of $\frac{1}{4}$ in. square brass rod $\frac{5}{8}$ in. long. I have shown the ends rounded, but it doesn't matter an Aswan whether they are rounded or left square.

In the middle of one of the facets drill a No 30 hole halfway through, and at right angles drill a No 14 hole to meet it. This must be a very tight fit for a $\frac{3}{16}$ in. copper tube. Two of the flanges have pieces $\frac{11}{32}$ in. long pressed into them, and the other two have pieces $\frac{9}{32}$ in. long, the

latter having $\frac{1}{8}$ in. length of $\frac{3}{16}$ in. \times 40 thread on them (see section).

Silver solder the lot and screw the threaded ones into the tapped bosses on the steam chests through the holes in the frame. Smear the threads with plumbers' jointing, and when the screws are tight home the drilled side should be uppermost and horizontal, as shown in the plan.

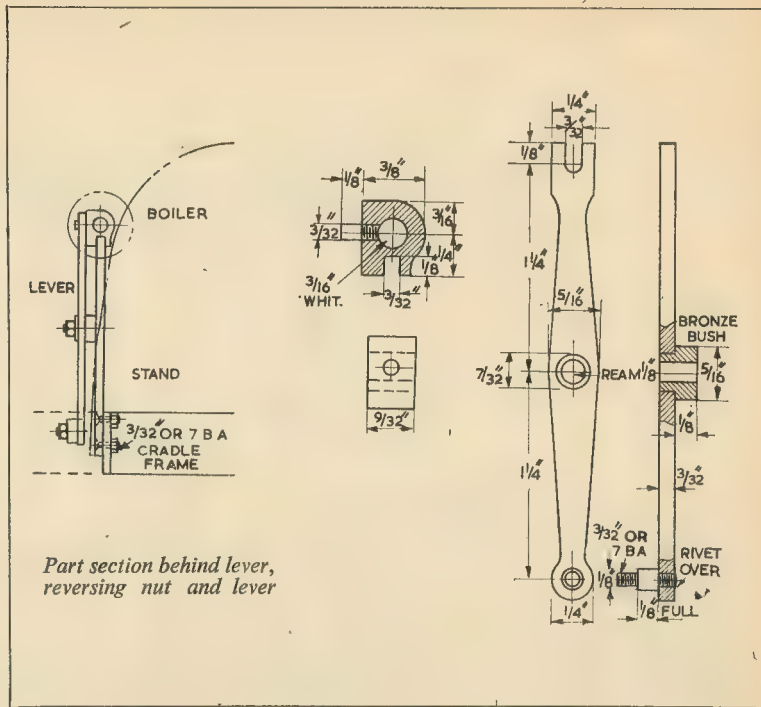
Chuck a piece of $\frac{5}{16}$ in. brass rod, face the end, part off a $1\frac{1}{2}$ in. length, rechuck it, and put about $\frac{1}{4}$ in. length of $\frac{5}{16}$ in. \times 32 thread on the end. At 1 in. from this end drill a No 14 hole right across it. Chuck it again, threaded end outwards, centre deeply, and drill right down with a No 24 drill until it breaks into the cross-hole. Reverse in the chuck, centre, drill into the cross-hole with $\frac{1}{16}$ in. drill, open out to $\frac{5}{16}$ in. depth with $\frac{3}{16}$ in. drill, and tap $7/32$ in. \times 40. Slightly countersink the end and skim it true.

Push the bits of tube in the other flanges into the cross-hole so that when the assembly is placed with the flanges on top of those already in place, they match exactly—as shown in the illustration. The contact faces of all four should be trued up as described for the slide valves and so on; then there will be no steam leakage. Make any adjustment necessary to get them exactly in line, then silver solder the tubes into the standpipe.

Pickle, wash off and clean up, then fit the bottom cap. Chuck a piece of $\frac{5}{16}$ in. hexagon rod, face, centre deeply and drill to $\frac{1}{2}$ in. depth with No 44 drill. Turn down $\frac{3}{16}$ in. of the outside to $7/32$ in. dia. and screw $7/32$ in. \times 40. Part off at $\frac{1}{4}$ in. from the shoulder, reverse and rechuck in a tapped bush, turn down a full $\frac{1}{2}$ in. to $7/32$ in. dia., screw $7/32$ in. \times 40, skim the end true and poke a $3/32$ in. parallel reamer through.

Seat a $\frac{1}{8}$ in. rustless ball on the faced end and assemble as shown, with a light spring between the ball and the end of the recess. This is necessary, as these little balls have a tendency to float in the thick cylinder oil, and allow the oil to blow back.

Drill two No 41 holes in each flange attached to the stand-pipe, set the assembly in place as shown, then put the drill down the holes and make countersinks on the lower flanges. Drill these No 48, tap $3/32$ in. or 7 BA, and smooth off any burring. Erect as shown, putting a $1/64$ in. Hallite or similar gasket between the contact faces—and don't forget to punch the hole in it for steam to pass. Needless warning? Not on your life! I know of several cases where "blind" gaskets haven't been discovered until the engine was taken out for its trial run, and to remedy the oversight this entailed taking off the boiler.



EXHAUST PIPE ASSEMBLY

As there are no extra connections to the exhaust pipe, I have shown the assembly made up with the usual running joints used by plumbers. To make the tee (not tea, I hasten to add!) chuck a piece of $\frac{3}{8}$ in. square rod truly in the four-jaw, face the end, and part off a $\frac{3}{8}$ in. length. Rechuck, centre, drill through with $7/32$ in. drill and tap $\frac{1}{2}$ in. \times 40.

In the middle of one side drill a $\frac{5}{16}$ in. hole. Cut a piece of $\frac{5}{16}$ in. copper tube $2\frac{1}{2}$ in. long, chuck in the three-jaw, face the end and put a few $\frac{5}{16}$ in. \times 40 threads on it. Face the other end and fit it into the hole, silver soldering the joint.

Chuck a piece of $\frac{1}{4}$ in. copper tube, face the end, and screw it $\frac{1}{4}$ in. \times 40 for $\frac{3}{8}$ in. length. Part off at $\frac{3}{8}$ in. from the end, reverse in the chuck and put $\frac{1}{2}$ in. only of $\frac{1}{4}$ in. \times 40 thread on the other end, leaving $\frac{1}{2}$ in. of "plain" between the two screwed portions. This is important.

Repeat the operation, then make a couple of lock-nuts $3/32$ in. thick from $\frac{3}{8}$ in. hexagon brass rod, tapped $\frac{1}{4}$ in. \times 40 to fit the pieces of tube. Screw them on to the long threads as far as they will go, then screw the tubes into the tee until they touch in the middle. Hold the assembly in line with the tapped holes in the bolting faces of the cylinders, with the blast pipe vertical, then screw the tubes out of the tee into the tapped holes until

the end of the short thread on each comes up against the cylinder casting.

Finally, run the lock-nuts back against each side of the tee and tighten them, but take care to avoid stripping the threads. Owing to the restricted width between frames, it is a ticklish job to screw the pipes home, but it can best be managed by using a pair of the very thin gas pliers sold for burner and stove jobs. I have a pair, the jaws of which are only $3/32$ in. thick, yet they will hold up to $\frac{3}{4}$ in. pipe.

Alternatively, if desired, the assembly can be made up and erected in a manner similar to the steam-pipe assembly; no tee would be required. The blast pipe should be cross-drilled like the steam stand-pipe, the cross pipes silver soldered in, and the blast pipe plugged at the bottom. Make the flanges from $\frac{5}{16}$ in. brass rod, and use $\frac{1}{4}$ in. pipes. Had it not been for the low-pitched boiler I should have specified a breeches or inverted Y-pipe with flange attachment.

The blast nozzle is made from $\frac{7}{16}$ in. hexagon brass rod. Chuck, face, centre, drill to $\frac{1}{2}$ in. depth with a No 34 drill, open out to a full $\frac{1}{2}$ in. depth with $9/32$ in. drill and tap $\frac{5}{16}$ in. \times 40. Part off at $\frac{3}{8}$ in. from the end, reverse in the chuck and turn the other end to a blunt cone as shown. This should not be fitted permanently until the boiler is erected.

● To be continued

WEST RIDING RALLY

Reported by Northerner



SUNDAY is always the best day of the West Riding Small Locomotive Society's rally. Perhaps it was the brilliant sunshine (as at Brighouse the week before) which kept people away on Saturday, tempted no doubt by gardening and other delights. Certainly Sunday was, as ever, the better attended day.

As it was, however, those enthusiasts who brought locos on Saturday had the opportunity to spend longer than usual on this magnificent track.

One of the first people I saw was my old friend E. Hinchliffe, of Rochdale, just unloading his 3½ in. gauge Pacific *Pinza* from the van. It was not long before she was haring round the track, rather like her race-horse namesake.

A musical ringing of gears was heard in the distance, and recognising the sound, I went to watch the arrival of Foden traction engine No 2312. Driven by S. Bentley, of Silsden, who is co-owner with F. D. Woodall, of Shipley, she had been delayed considerably on the journey by the need to find water. This is one of the snags attending any lengthy traction-engine drive, of course.

Since last year, the Foden has been fitted with a full-length canopy taken from a scrapped roller; this not only improves her appearance but affords a certain amount of protection during the winter months.

Harrow and Wembley Visitors

Soon, she was gently ticking over and her smart green and red livery was lovingly polished by Frank Woodall. (Incidentally, Frank's vintage Morgan three-wheeler, with its o.h.v. Jap engine and its acetylene lighting, always creates interest wherever he goes.)

Two regular visitors to the West Riding rallies are A. E. Tyler and J. Richardson, of the Harrow and Wembley club. The former's 0-6-0 tank engine is an excellent worker, hauling loads of children round the track with no trouble, and with little expenditure of fuel and water.

Mr Richardson's GER 2-4-0 loco *Petrolea* is also a good performer,

and is full of beautiful detail—for example, a steam donkey pump and working vacuum brakes are fitted. On the tender are two tiny toolboxes with hinged lids, and correct hasps and staples. A passing mention should be made of Mr Richardson's natty headwear, a trilby with the brim cut off, except for a peak at the front. Very smart and practical, it keeps the cinders out of the hair and the sun out of the eyes.

Don English's *Netta*, a 5 in. gauge loco seen also at Brighouse the previous week, only took twelve months to build, and has four rings on each piston. Now driven by R. Bairstow, also of the Wakefield club, she made easy work of a load of 23 children—a tribute not only to her builder but to LBSC.

In the evening Dan Hollings steamed his 7½ in. gauge 0-4-4 tank engine, which in performance, appearance and perfect finish was up to the standard one always expects of him. This engine was not built from any especial prototype, but is a fine representation of the type of loco used extensively for suburban traffic at one time.

Novel test

Another good performer from the home club was the 5 in. gauge freelance tank *Master John*, built by H. Royston. She is largely based on the A. J. Reeves design *Gert* with some of Mr Royston's own ideas incorporated. For instance, the smoke box is extended downwards between the frames to enclose the valve-chests and to prevent any condensation.

In the marquee there was a splendid display of engines built and being built by members of the West Riding club. These included A. Woodhead's first attempt, a 5 in. gauge *Maid of Kent*, which had passed her steam test with flying colours.

Not having his own track, Mr Woodhead adopted the somewhat unorthodox method of greasing wheels and rails, and braced the engine against the bench by a plank. He told me that when the regulator was opened, he was covered in flying grease, but what a thrill to know that the engine really worked, after all the time and effort he had put in! He was now looking forward to her first trial run on the club track, but for this he wisely preferred a less public occasion.

The 25 societies present at Blackgates brought with them 22 locos in 2½ in., 3½ in. and 5 in. gauges. After the visitors' running, WRSLs members further exploited the track's gauge-capacity by running some 7½ in. locos including A. Balmforth's well-known "100-mile" L.1 tank and W. D. Hollings' 0-4-4 tank mentioned above. ■

PARTICIPATING SOCIETIES

Cumberland Crewe Blackpool	Grimsby Ashton-u-Lyne Harrow and Wem- bley	Wakefield Bolton
Warrington Brighouse Keighley Huddersfield Barnsley Sheffield and District	Rochdale Deane and Dist Stockport Lancs. and Ches. Ship Modellers Soc.	Bradford Colne Louth Wigan Spenborough ICI (Ardeer) Urmston and District

W. D. Hollings drives his new 7½ in. gauge 0-4-4 tank loco with A. Woodhead behind
(Pictures: W. D. Hollings)



Ship modelling for beginners

QUAYSIDER describes in his sixth article the first steps in the construction of the model

THE first part of the hull to be made in building on the egg-box system is the keel. The most suitable material for this is good quality $\frac{1}{4}$ in. plywood. The outline should be drawn or traced on the wood from the particulars given on the construction plan, Fig. 18 [June 20] and from the full-size drawing of Fig. 17 [May 9] obtainable from the Percival Marshall Plans Service.

The keel may then be cut out with a fretsaw. The amount of subsequent trimming and fitting will depend on the care with which the lines have been followed. Special attention should be given to the slots, to see that they are truly vertical and a good tight fit for the frames. The frames should be made next also from $\frac{1}{4}$ in. plywood. Care must be taken to get the shape accurate, and the slots true and well-fitting to the keel. If they are assembled on a piece of $\frac{1}{4}$ in. wood, with their faces in contact and in the correct order, any discrepancy will be at once apparent.

They should be compared with the outlines on the body plan, Fig. 17 [May 9].

If any of the slots are found to be to one side or out of square you must make a new one or correct it by making the slot wider and insert a piece of stiff card or a sliver of wood at the other side to compensate.

THE COUNTER PIECES

The two pieces for the counter should be made next. These rest on the aftermost filling pieces and their upper faces are level with the underside of the deck, except around the edges where they are continued up to the underside of the rail, the sides forming the bulwark around the stern. Blocks of good quality, close-grained wood, such as a lime or beech, should be used, and the tools must be sharp to prevent splitting through undue pressure when cutting.

As shown in Figs 20 and 21, there is a rebate on the outer side of each of the pieces $\frac{3}{4}$ in. wide from the forward face and $\frac{1}{8}$ in. deep. The after ends of planks 10 to 14 fit in

these rebates, whereby the difficult job of fitting them under the counter is avoided. Care must be taken in cutting this rebate so that when the planks are fitted they will lie true with the general lines of the hull.

Making these blocks is probably the most difficult part of the whole job, but it only needs a little extra care to make a success of it. The most advanced ship-modelling—or any other model-making for that matter—is only a case of doing one job after another, but doing each with care and precision.

The starboard side block is shown in detail (Fig. 20). An actual size drawing is available from the Plans Service. Templates should be made of the elliptical form in the plan, and of the forward face. The outline of the profile is cut to the outline of the centre plate, as is also the surface on which the deck is to rest. To ensure a good joint, the cut-away for plank 8 should be made when planking. A similar block made to the opposite hand is required for the corresponding piece on the port side, and

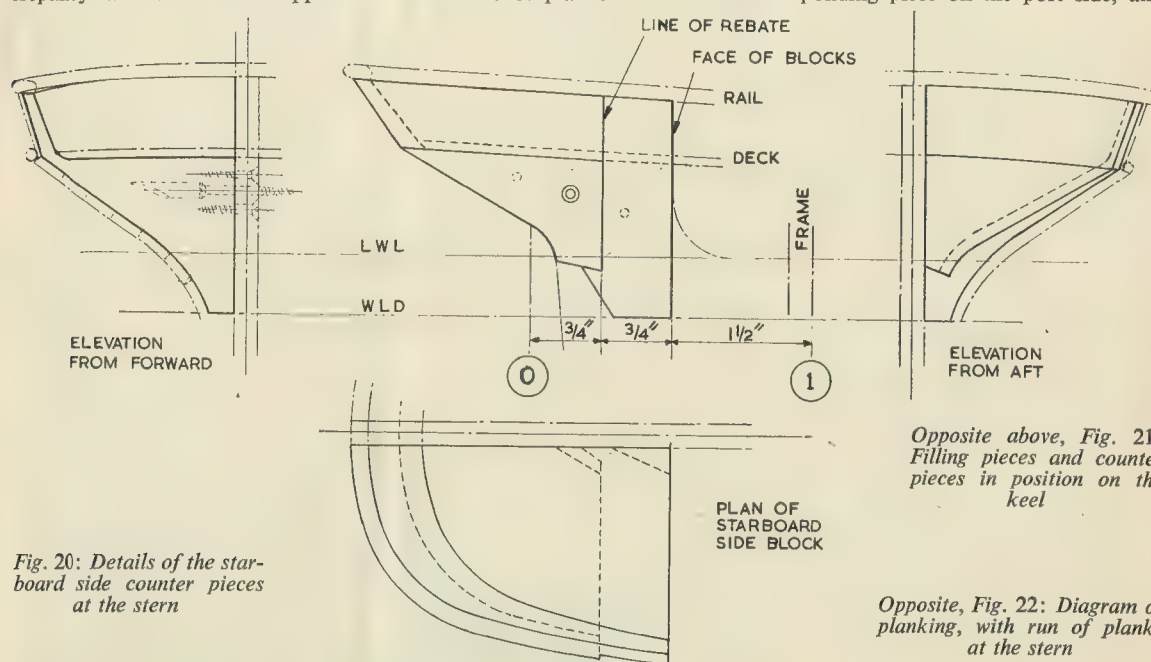
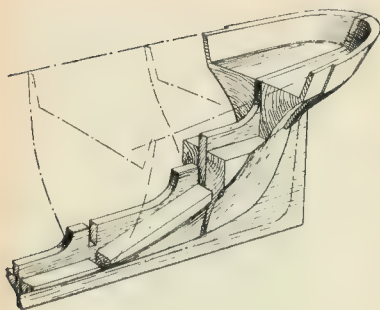


Fig. 20: Details of the starboard side counter pieces at the stern

Opposite above, Fig. 21: Filling pieces and counter pieces in position on the keel

Opposite, Fig. 22: Diagram of planking, with run of planks at the stern



the same templates should be used for both.

The pieces should be secured in position on the centre plate by means of screws, two being screwed into the starboard side block with their heads filed flush with the centre plate, and a longer screw between them through the starboard block and the centre plate to secure the port side block. The recess for the head must be plugged with wood. To reduce the diameter of the recess the head of the screw could be reduced (Fig. 20). These screws should not be larger than No 4s as they are only intended to keep the blocks in position while gluing them. The general appearance of these blocks will be seen in Fig. 21. In this drawing the frames have been omitted for the sake of clarity.

The frames should now be assembled on the keel, using a waterproof adhesive. Make sure that the surfaces of the slots in both frames and keel are well coated. When everything has set hard the edges of the frames must be bevelled to form a proper bed for the planks. A batten should be used, and the frames bevelled so that it lies closely on the edge of each of the frames.

This work should be done carefully. The more care the beginner takes over

jobs like this the sooner will he become an expert ship-modeller.

THE FILLING PIECES

The filling pieces should be made from a piece of good quality pine or similar wood $\frac{3}{8}$ in. thick. Each pair is different and the shape as shown on the construction plan, Fig. 18 [June 20], should be closely followed. They must be a reasonably tight fit between the frames. Pin and glue them in position and then bevel them to blend with the frames and the counter pieces. The bevelled portion is shaded, Fig. 18 [June 20].

On the deadwood at the stern, and to a lesser degree at the forefoot, the slope is very gradual, but amidships it is rather abrupt. Passing the finger tips along the bevel and across the frames will show any irregularities which should be smoothed out.

PLANKING THE HULL

For planking the hull, wood with a straight grain and close texture is required so that it will not split readily. Some builders, especially in model yacht building, use pine—Parana pine is a favourite—and others use mahogany. Personally I would prefer mahogany, but it must be selected carefully. Some mahogany has a very erratic grain and is difficult to plane, but the best mahogany is quite suitable. Cedar is a good wood for planking and very pleasant to work, having a nice straight grain and taking a good finish.

Any planking wood must be thoroughly seasoned, as when it dries out it shrinks in the direction of its width, which militates against keeping the hull watertight.

I have already said that the planking should be $\frac{1}{8}$ in. thick. Although this may seem to be rather thick the beginner will find it easier to make a

tight joint with it, and when the hull is planked there is plenty of thickness to enable him to rub it down properly and to get a nice smooth surface with all the curves correct and without angles or corners.

An examination of the sections in Fig. 19 [June 20] will show that the edges of the planks are not all at right angles to the surface. Around the curve of the bilges (see station 5) the inner surface of the plank is narrower than the outer, and as the same planks approach station 1 the outer surface is narrower than the inner.

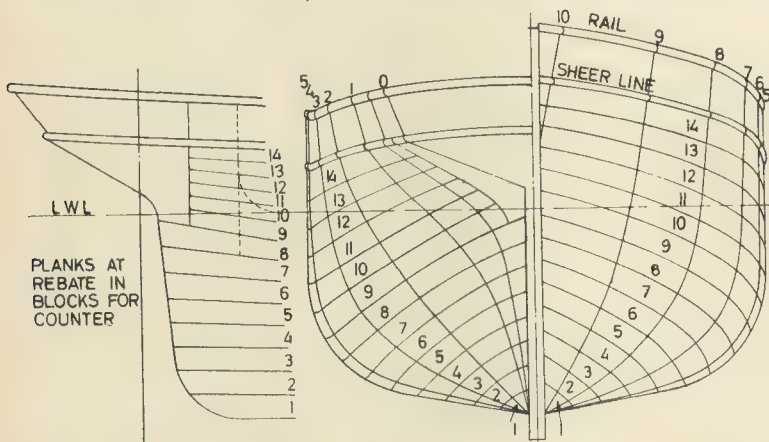
The invariable rule is that where the surface of the hull is convex the planks are narrower on the inside, and where the surface is concave they are narrower on the outside. This is easily seen as the planking proceeds, and the edges of the planks should be bevelled accordingly, so as to give a close fit all along, not only on the surface but throughout the thickness of the plank. At no place, however, is there more than a very slight bevel.

Before laying the planks, the edges of the frames should be marked to show the width of the plank at that particular frame. The planking diagram (Fig. 22) will help in this matter. I remember in one of my early attempts at planking I began at the keel as usual and put on a plank more or less parallel. As the hull had a rather flat floor, I carried on with other planks, which were also too parallel. When I came to the bilges I had to make the width overscale, and even then the planks became too narrow and crowded at the stern. The only thing I could do was to strip it and start all over again and by that time it was difficult to avoid the old holes in the frames and stem when putting in the new screws.

The number of planks on each side depends on the width of the strip you are using for the planks, and on the distance from the keel to the sheer line at the midship section. In our case this distance is about 6 in. so I suggest the use of $\frac{1}{2}$ in. wide strip and, allowing for trimming and fitting, you will require 14 planks per side.

The distance along the edge of each frame from the keel to the sheer line must be divided into 14 equal spaces, and these divisions marked on the frames. It is obvious that the maximum width of the planks will be on the midship section. The planks taper gradually from amidships to the stem, but toward the stern, after diminishing in width to station 2, from there they tend to increase a little owing to the convexity of the surface toward the sternpost.

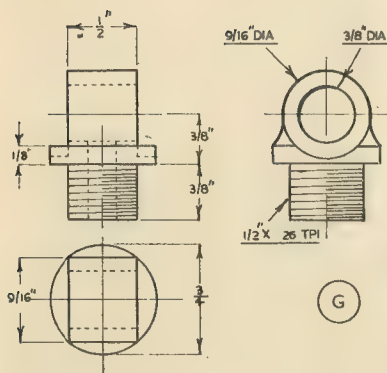
● To be continued



SPRAY MIST LUBRICATION

for the small workshop

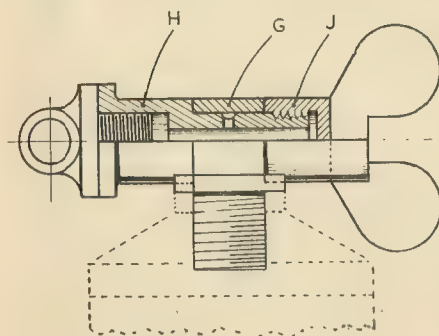
Conclusion of the three-part
article by DUPLEX



THE purpose of the swivelling union is to allow the primary container to remain upright irrespective of the angle to which it may be necessary to set the nozzle itself.

An inspection of the illustration (Fig. 12) will show that the assembly consists of three parts, the banjo G, the banjo H and the wing nut J.

The banjo G (Fig. 13) is best made from bar material; either brass or light alloy will serve, turning and threading the $\frac{1}{2}$ in. \times 26 t.p.i. spigot first. At the same setting the $\frac{3}{8}$ in. dia. transverse hole may also be drilled.



Above, left, Fig. 13: Banjo G

Left, Fig. 12: The swivelling union

Below, left, Fig. 14: Banjo bolt H

Below, Fig. 15: Wing nut J

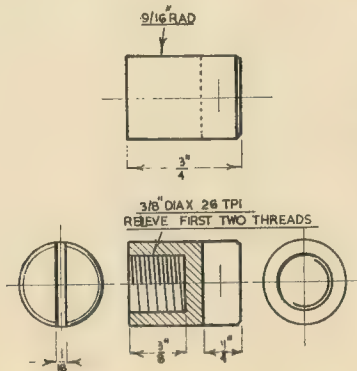
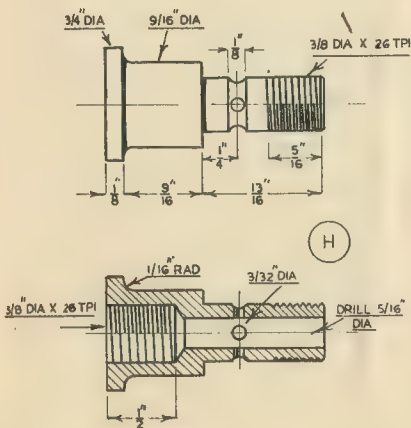


Fig. 12a: The swivelling union in place on the primary container

The work may then be transferred to the four-jaw independent chuck to enable the $\frac{3}{8}$ in. dia. transverse bore to be machined, and the abutment face for the banjo bolt to be formed. The opposite face is best machined with the work removed from the independent chuck and mounted on a true running stub mandrel.

BANJO BOLT H

The banjo bolt (Fig. 14) is a straightforward piece of turning, and little need be said about it except that care must be taken to see that the finish and the squareness of the shoulder that abuts on the banjo are without reproach. It has not been found necessary to use cardboard washers

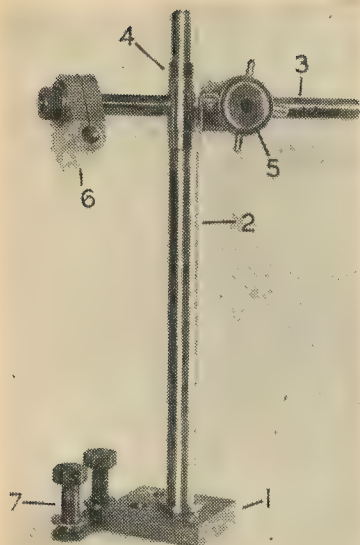


Fig. 16: The lathe stand

at this location provided the machine work is good.

As will be seen, an annular recess is machined round the bolt in order to provide a channel for the lubricant passing from the container by way of the banjo.

THE WING NUT J

The wing nut, too, is of simple construction (Fig. 15). The turning operations present no difficulty at all and the threading is readily carried out by a tap held in the tail-stock chuck.

The slot to receive the wing piece is, of course, best formed by milling;

but it may also be formed by filing. If the latter method is used it is as well to thicken up the wing-piece so that an enlarged slot may be employed.

THE STAND

The stand (Fig. 16) is similar to the one used for dial indicators; indeed, some of the parts of the original unit were borrowed from this source. Figs 17, 18 and 19 will make clear the details of the various parts.

The work is within the capacity of all but the beginner; in any case the design can be simplified by anyone who feels the need of something a little less elaborate.

It should be remembered, however, that if the design is modified or simplified the result must be a rigid construction otherwise the work will be in vain.

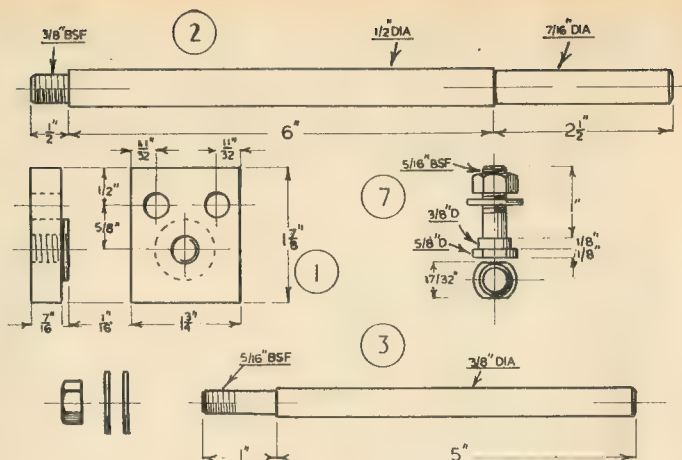


Fig. 17: Parts of the lathe stand

TWO BOOKS BY DUPLEX

SCREW threads, screw threading equipment and the general methods of screwcutting are expertly dealt with in the practical guide *Screw Threads and Twist Drills*, by Duplex.

Clearing sizes suitable for a wide variety of work are listed, and a table of twist drills, including the fractional millimetre sizes, is given to enable the mechanic to choose the appropriate clearing, tapping and reaming size drills.

Another book by the same author, *Sharpening Small Tools*, also deserves a place in the library of the home craftsman. In addition to a description of the tools in general use there are chapters on abrasive materials, stoning and grinding, and the sharpening of metalwork and wood-working tools.

Both books are priced at 3s. 6d. each and are obtainable from Percival Marshall, 19-20 Noel Street, London, W1. Postage is 3d.

Fig. 18: Clamps for the lathe stand

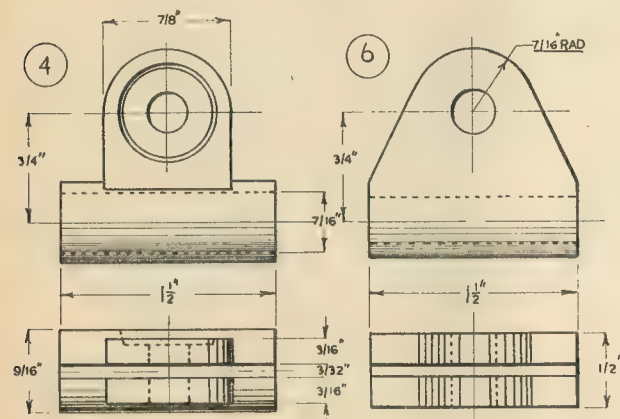
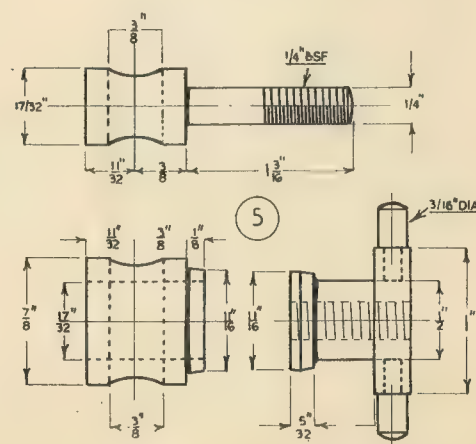
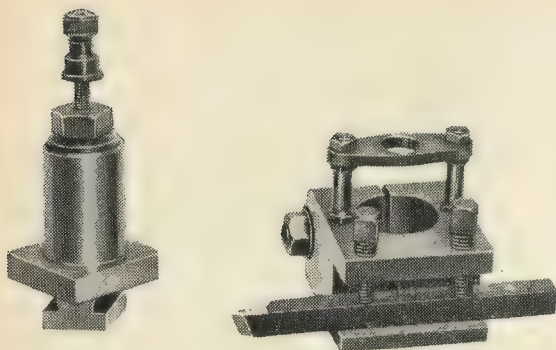


Fig. 19: The clamp bolt





The Norman tool post and adapter

ordinary English measure, in $\frac{1}{16}$ s and so on, or decimal measure.

The smallest divisions are cut to the first horizontal line, major fractions to the second line, and inch dimensions completely round the shaft, carefully controlling the movement of the chuck by hand, the mandrel for this operation being, of course, in open gear.

CROSS-SLIDE STOP

There are many lathe operations which are more comfortably handled when one does not have to keep a lifting eye on feed screw dials—that is, when the slide rest can be fed up to positive stops in both directions. The cross-slide stop, controlling penetration, is invaluable when working to a fixed depth as in milling squares, hexagons and the like, keyway and spline cutting, fluting, etc. Fig. 8 shows the constructional details of this fitting.

The stop itself is a piece of iron tubing $\frac{3}{8}$ in. bore \times $\frac{1}{2}$ in. external diameter. It should be cleaned up and then screwcut between centres so that it will turn concentrically without fouling the feed screw when secured in place; the end of the tube makes contact with the back face of the cross-slide nut as the latter is screwed in to the required penetration, at which point the locking nut is tightened to secure it in place.

The knurled button at the outer end of the screw is silver soldered or secured by a cross pin. To mount the appliance two $\frac{1}{4}$ in. BSF tapping holes need to be drilled into the back edge of the saddle which is already machine faced.

SADDLE STOPS

As will be seen from the drawings (Fig. 9) the left-hand stop is very positive—that is to say, it clamps solidly to the bed so that there is no chance of a ruinous dig-in at a turned shoulder.

The right-hand stop cannot be made to the same robust design because the wide saddle wings and

the tail-stock overlap each other; a further obstruction is the thread-cutting indicator. Therefore, though a stop may be mounted on the front shear after removing the latter fitting, a weighing of the pros and cons came out in favour of the right-hand stop being mounted on the back shear, accepting the slight inconvenience so caused.

For obvious reasons this stop is not quite so important as its opposite number; nevertheless, although it may not appear quite so tenacious as the latter, there is no reason why it should not remain quite secure with ordinary care.

GEAR TRAIN

When fitted with the Norton type gearbox the lathe is capable of cutting a range of threads from 4 t.p.i. to 60 t.p.i. by changing only one gear-wheel above the 30 t.p.i. mark.

To make the change from the coarse to the fine range, a 24 t. gear is substituted for a 48 t. gear, but, unfortunately, this evolution entails a juggling act with spanners of three different sizes, i.e., $\frac{1}{4}$ in. on the stud *A* carrying the gears to be changed, $\frac{3}{8}$ in. on the quadrant nut, and $\frac{1}{2}$ in. on the idler stud *B*.

This feat of legerdemain can be eliminated quite simply. A $\frac{3}{8}$ in. Whit. tap bolt is reduced and threaded $\frac{1}{4}$ in. Whit. for stud *A*; this still allows the gearwheel to be withdrawn over the head of the bolt when changing. The idler stud never requires to be rotated more than a fraction of a

turn to slacken it off. Therefore, selecting the most convenient faces, two flats are milled to suit a $\frac{3}{8}$ in. Whit. spanner, which still leaves ample strength at the neck of the stud. The net result of all this is that the gear change can be made with one spanner only.

In actual fact, though the Book of Words does not mention it, a good deal of this gear-changing business can be avoided by the intelligent use of the tumbler lever.

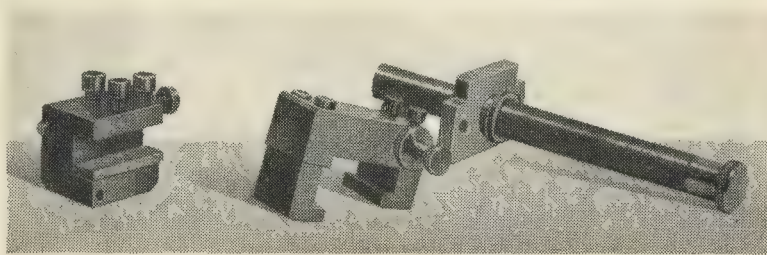
While a change of gear wheel from 24 to 48 t. is indicated below 32 t.p.i. in the Book the same result can be obtained by retaining the 24 t. gear and moving the tumbler lever to position *B*; as the ratio *A* to *B* is 1 to 2 this has the effect of halving the thread cutting ratio, e.g., 32 to 16, and so on. By moving the lever into position *C* the thread cutting ratio is again halved, i.e. 16 to 8, and so on, below which figure a 48 t. gear becomes essential.

However, as the 24 t. gear is used for fine feeds also, it can be retained in position for *all* threads except those between the 8 to 4 range, which, after all, are used but infrequently.

The index chart mounted on the headstock casing of the lathe reads as shown (Fig. 11) to the left of the double line; it will be clear from the preceding remarks that a chart which also carried the additional information given to the right of the double line would have a profound appeal to those who, like myself, prefer to avoid chores; by using this version of the chart, the widest range, by far, of fine feeds and thread cutting can be obtained without shifting a gear wheel.

Speaking of feeds, the finest that can be obtained with the normal gear train as fitted to the lathe is 0.0033 in., the ratio of traverse of the leadscrew to that of the feed screw being 5 to 1. While this is quite satisfactory for the majority of jobs, there are occasions when a finer feed becomes very desirable, particularly on small work.

In the outfit supplied, even though the lathe is fitted with a quick change gearbox, several loose gears are included mainly for the purpose of



The cross slide and saddle stops

cutting metric threads, among them being a 56 t. and a 36 t. By the use of a simple adapter (Fig. 10) they can be disposed so as to give a feed of 0.0014 in.—that is, approximately, only two-fifths of the finest standard feed.

In order to do this the final drive to the gearbox, a 30 t. "special" with a long boss, is removed and the

adapter carrying a 56 t. gear replaces it; this in turn meshes with the 36 t. gear mounted alongside the idler on the same stud. The resulting gear train is shown in Fig. 10b in which it will be seen that the idler stud now carries an intermediate reduction gear.

The velocity ratio of the open gears for the standard fine feed (Fig. 10a) is:

$$\frac{38}{76} \times \frac{30}{30} \times \frac{24}{30} = \frac{2}{5} \text{ i.e. a VR of 5 to 2.}$$

The gearbox ratio in this setting is:

$$\frac{18}{36} \times \frac{27}{27} \times \frac{20}{30} = \frac{1}{3} \text{ i.e. a VR of 3 to 1.}$$

and the combined VR = $\frac{2}{5} \times \frac{1}{3} = \frac{2}{15}$ i.e. a VR of 15 to 2.

The leadscrew having 8 t.p.i., and the feed shaft to leadscrew ratio being 1 to 5, the traversing feed is:

$$\frac{2}{15} \times \frac{1}{8} \times \frac{1}{5} = \frac{1}{300} = 0.0033.$$

With the modified arrangement (Fig. 10b) the VR of the open gears

$$\frac{38}{76} \times \frac{30}{30} \times \frac{24}{44} \times \frac{36}{56} = \frac{27}{154}.$$

And as the leadscrew to feed shaft, and gearbox ratios remain constant, the final reduction is:

$$\frac{27}{154} \times \frac{1}{3} \times \frac{1}{5} \times \frac{1}{8} = \frac{9}{6160} = 0.0014.$$

It will be realised that, by making use of the sector and tumbler levers, a very large range of coarser feeds is available with this rig. The change over from the extra fine feed rig to the normal for screwcutting, or vice versa, is quickly accomplished as the only gear to be exchanged is the final one C on the lead screw. The 36 t. gear on stud B can remain in place as it does not interfere with the normal train.

"ARMSTRONG PATENT" HANDLE

Occasions arise when screwcutting operation becomes a little too tricky for power work. Internal thread-cutting in a very shallow or blind hole are examples which, I am sure, all readers will have encountered at one time or another. Saddle stops can be of great assistance in such cases, not exactly to stop the saddle traverse, but to warn the operator when the hidden tool is approaching the danger point.

However, in most of such cases there is nothing to beat the manual touch—that is to say, turning the mandrel by hand; this method in conjunction with the saddle stop is infallible under the most difficult conditions. All that is needed is a crank buttoned on to the mandrel.

The basis of the one I use is a full-size cycle crank but I must admit that it gives me the feeling of turning a mangle! Anyone wishing to add this very useful article to the outfit of the lathe might be able to persuade his local cycle dealer to look out for something not quite so hefty—scrap from a boy's cycle, for instance.

For the reason implied Fig. 12 shows only the expanding plug which fits inside the hollow mandrel; the manual end of the crank is fitted with a suitable file handle drilled for a centre pin.

SECTOR LEVER POSITION				FROM HANDLE A		TO STUD	
60	56	52	48	44	40	36	32
A	A	A	A	A	A	A	A
24	24	24	24	24	24	24	24
16	16	16	16	16	16	16	16
12	12	12	12	12	12	12	12
8	8	8	8	8	8	8	8
4	4	4	4	4	4	4	4
2	2	2	2	2	2	2	2

FIG. 11 INDEX CHART.

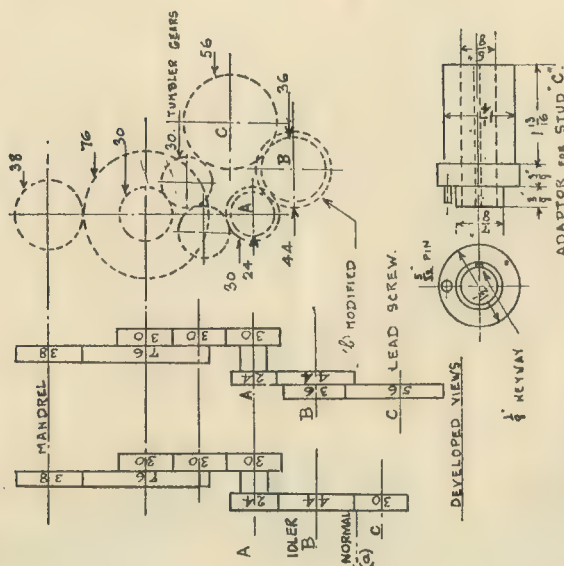


FIG. 10. FINE FEEDS.

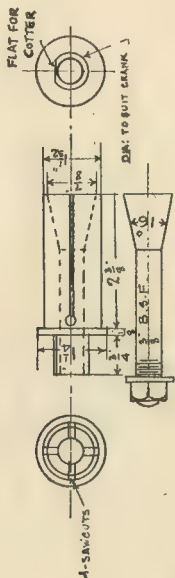


FIG. 12. EXPANDING PLUG FOR CRANK HANDLE.

Do not forget the query coupon
on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Saw power unit

I have a 1/3 h.p. Crompton single phase motor, giving 1,425 revs at 2.9 amp, and wish to make this the power unit for a circular saw. Can you advise me as to a practical size for the saw blade—i.e. 8 in. or 10 in.—and at what revs this should work?

The saw is for general use in the workshop and would have two alternative blades, rip and peg-tooth.—HAL, Swindon.

▲ You are probably aware that even a small diameter saw is capable of absorbing considerable power to produce its maximum rate of cutting, but it is possible to do quite a lot of useful work at relatively low powers and it is assumed that the general use you refer to would not include maximum rate of production.

In the circumstances, an 8 in. saw driven at approximately twice motor speed, that is to say about 2,800 r.p.m., would be generally useful. But the speed quoted for woodworking saws in industrial work is considerably higher than this and would require correspondingly greater power.

Bronze for valves

I am building a coal-fired 2½ in. gauge loco. I am using bronze castings for the cylinder blocks, but will brass be a suitable material to use for the slide valves and pistons? I have some of this material on hand.—PMJ, Horsforth, Yorks.

▲ Brass is not a suitable material for use as slide valves in any cylinders. It is much too soft. Bronze for the valves is a much better proposition.

Magnetising seating

My trouble lies in getting a small ball valve magnetised, this valve being made of hardened cast steel. I would like to have it magnetised—that is, if it is possible to magnetise cast steel—so that it would attract and hold a ¼ in. steel ball in the seating.—WS, Loughborough, Leics.

▲ It is possible to magnetise hardened cast steel fairly satisfactorily, but it is by no means certain that the magnetism would remain permanent for an indefinite time. Some of the special magnet steels retain their magnetism indefinitely but most of these are extremely difficult to machine and, in some cases, only grinding is possible.

If it is essential that the seating be magnetised, some method of applying an external magnet of larger size than the small valve seating would be advisable or, if it is possible to employ electric current, a coil could be wound around the outside of the housing which contains the valve seating so as to make it the core of an electro magnet.

Loco testing

I am attempting to put a 5 in. gauge 0-6-0T locomotive that has been given to me into working order for a year or two while I build a locomotive from scratch.

This locomotive has not been in use for some 20 years, and is fitted with a steel boiler which I have cut through to examine internally for corrosion. I am glad to say that it is in excellent condition.

I have no idea of the original working pressure of the boiler and would like your advice as to the maximum safe working pressure. The boiler barrel is 6 in. o.d. and the minimum wall thickness was 0.197 in. (say ⅜ in.) when I checked it. The fire box is much thicker and is well stayed and the barrel is 12 in. long.

Is it possible that working pressures—say 25 years ago—were lower than they are today, and is a lubricator essential when cylinders are made of cast iron?—DWP, Birmingham.

▲ The boiler should be submitted to a hydraulic test up to, say, 150 p.s.i. If it will hold this pressure for about half an hour without showing signs of leakage it could be worked safely at a steam pressure of 90 p.s.i.

You are strongly advised to fit a lubricator for the cylinders, no matter what they are made of.

Gluing planks

I am building a model yacht by the planking method, the planks being secured to aluminium ribs by screws and nuts.

Could you help me with respect to the caulking between the planks which are ⅜ in. × ⅜ in. mahogany. I am thinking of painting the hull so that anything used will be covered.—HES, Croxley Green, Herts.

▲ Caulking as applied to full-size shipbuilding is unknown in building planked model hulls. In models the practice is to glue the edges of the planks as well as the face which is in contact with the ribs or frames. If

one of the modern resin glues is used caulking will be unnecessary; these glues fill up any slight gap and do not require great pressure in keeping the joint faces in contact.

It is, of course, advisable to make the planks fit as closely as possible before gluing in place, and to see that the edges are bevelled to suit the adjacent planks.

USS Princeton

I am interested in building a model of the USS Princeton, the first screw-propelled warship. I believe it was built about 1846-48 under the supervision of Commodore Robert Field Stockton. It was on this ship that a large gun burst, mortally wounding several members of the President's cabinet. I believe this happened in the year 1848.

Any bit of information you can give me, no matter how small, would be very much appreciated.—JPS, Rutherford, New Jersey.

▲ In speaking of this ship—built 1842—"Shipping Wonders of the World," a serial published about 20 years ago, says that in it John Ericsson introduced screw machinery for the first time below the water line of a ship. Ericsson's engines were of unusual design and of a type invented by James Watt. Cylinders were dispensed with and in their place segment-shaped chambers were used. The pistons were rectangles swinging on bearings as a door swings on its hinges. The piston hinge or bearing was carried outside the chamber and worked the propeller shaft by vibrating cranks and connecting-rods, without the use of gearing.

The following is the only reference to this ship in the "Mariners Mirror," the quarterly of the Society for Nautical Research (Vol. 26, p. 168): "In 1840 he [Ericsson] had, together with Captain Stockton, designed, built and equipped the steam frigate PRINCETON which had caused a great sensation on account of its power and the large number of novelties in its construction. Stockton took all the credit for himself until a bad explosion at one of the guns took place. Ericsson had actually warned Stockton about the design of this gun, but received all the blame for the accident."

You would probably get further information if you wrote to the Nautical Research Guild of America. The secretary is James W. Harbin, Jun., 4110 Beall Street, Landover Hills, Maryland.

POST BAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

A GRIEVOUS LACK

SIR,—There seems a grievous lack on the market today of a robust small-power steam engine. The interest in small steam plant persists—especially at the recurring times of oil shortage.

Fresh ideas on general ensemble and layout keep cropping up (e.g., the small Ricardo plant).

The variations possible while using an identical engine are innumerable; in fact, given a good standard engine, the most interesting—and exciting—possibilities lie in arrangements of its steam supply and control.

A highly-developed layout might call for a specially designed engine to give optimum results, but this does not in general gainsay the previous paragraph.

Can the ME do anything about this?

The present alternatives are: to design and make a special engine; to find and adapt a commercial engine, often too large or too heavy; or to use a “model,” designed and built for appearance rather than continuous full power running.

The nearest thing I know of was made by Stuart Turner some 25 years back, an enclosed BA 2 in. \times 2 in. in either single or two cylinder form (see also the Pearson Cox cycle engine or some of the bigger pneumatic tool motors).

Perhaps someone well up in motor-cycle engines could work out a design using as many standard m/c components as possible?

I think the essentials are ability to use hot steam, ample bearing surfaces and lubrication, ability to vary valve events—if not while running, then by simple changes of eccentrics, timing wheels etc.—and a very straightforward design which should include provision for reduced speed take off for pumps, lubricator and other ancillaries. And I think an engine for this purpose should be self starting (no dead centre) to be of the widest appeal. It would then be suitable for small launches and runabouts, as well as almost any stationary application.

I would suggest an SA three-cylinder radial type as being likely to give the best value for time and money, with a centrifugal control of the eccentric, giving full starting cut-off and short running cut-off (with,

perhaps, alternative hand eccentric control for applications requiring the engine to reverse). I have in mind something about 1½ in. B and S.

I should be glad to offer a modest premium for the best interpretation of this idea if the ME would care to run it. Design would have to be such as would be likely to encourage your trade advertisers to take it up—and to be known, perhaps, as the ME small-power steam engine.
Penrith, HAROLD A. ILLINGWORTH.
Cumberland.

MICROMETER ACCURACY

SIR,—Your contributor J. E. Foster [July 11] has, doubtless, had great fun and games designing and making the tool which he calls a “micrometer” and you sub-title as “an instrument for close tolerance work.”

If the error over the scale is 0.002 in., well, any careful workman can get as near as that with a decent 6 in. rule and a pair of tool room calipers. Mr Editor, if this is your idea of “close tolerance work” I suggest that you are in the wrong job and wasting your time. Get a job erecting structural steel work and you’ll be about right!

Model engineering in all its aspects is a creative hobby and, evidently, Mr Foster has this gift and will thus get great pleasure from using both his brain and his hands. May I congratulate him?

Alnmouth, CHARLES G. S. BUIST.
Northumberland.

RUST PREVENTION

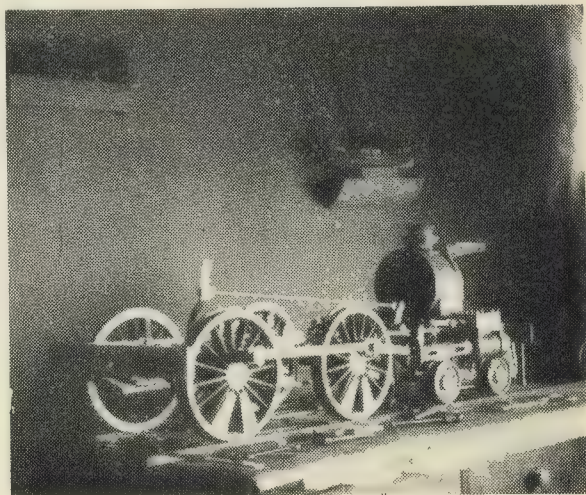
SIR,—I must congratulate J. H. B. Raw [June 27] on his article; I have had a lot of trouble with rust in my workshop.

I have a six-section Batley precast club hut of which four sections are workshop having eleven windows with slab roof. I got reasonably good conditions on the Fylde coast after the ceiling had been treated with fishroom gloss and cork dash, but here in the West Yorkshire hills at 860 ft elevation the condensation on the ceiling, walls, door and windows makes pools of water on the floor.

The cork dash was rubbed off during dismantling, transit and re-erection so I tried Thermoplas, the plastic for insulation in greenhouses, on 1 in. wide frames 1 in. from the ceiling, the frames being covered on each side, but it was not a success.

I am thinking of covering the existing roof with corrugated asbestos sheeting with a sandwich of Thermoplas—fibreglass—Thermoplas in between. The concrete slab roof has the peculiarity of freezing drops of moisture on its under side before the water in the bird bath starts to freeze. It seems to me that most of the inventors appear to have lived in Queen Victoria’s reign and it is curious that among all the electric radiators that have been on the market during the past 20 years in this country no one has produced a condenser similar to the pre-1900 one, which worked

From Stanley Dudginski, of Phoenix, Arizona, comes this picture of a 1½ in. scale Earley American standard engine in process of building



with a small gas jet and was very effective in extracting water from the air in the whole of the house.

The nearest thing I have come across is an American fitting called a de-humidifier made by GEC and operating on the refrigerator principle, a complicated machine costing all sorts of money.

The Victorian condenser was a very simple device about 4 ft high and 18 in. in dia. It consisted of two c.i. headers, one top and one bottom, the bottom one having a short piece of pipe about $\frac{1}{2}$ in. dia. sticking through the bottom and three studs to which three decorative feet were attached to leave space for a tin or shallow bowl.

A series of vertical brass tubes

fuel tank with well and feed tanks to go between the frames.

Flywheel rim is lead, cast on to built-up spokes and centre boss in two tin lids—one inside the other with clay stopping. Hoffman bearings are fitted. Displacer cylinder and piston were made from a car silencer pipe, fins being thin flanged copper discs made a tight fit with spacers.

Reverse is by slip crank (à la slip eccentrics) operated by gear wheel and toothed quadrant with extra teeth allowed for a kick start mounted on a spring loaded sleeve to draw back to clear if two consecutive starts are needed in one direction.

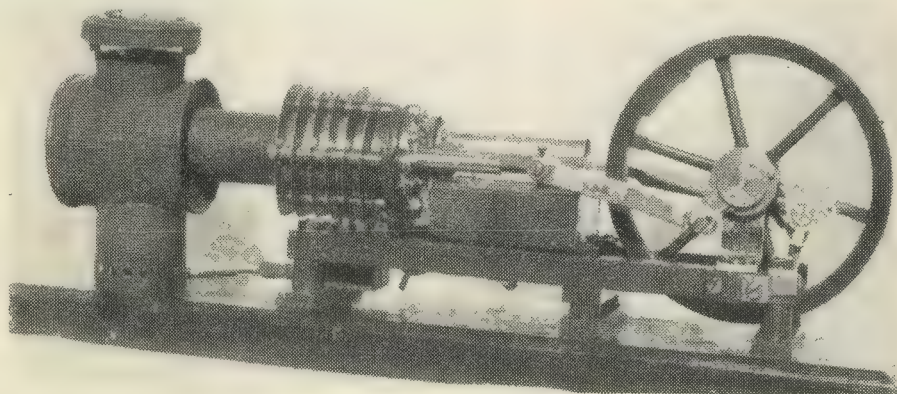
The power cylinder was made from a cycle pump barrel (old brass

mine was doing most revs; I was inclined to agree. His had no balance weight, the position of which I find makes a lot of difference and is very sensitive towards the revs. Sussex. S. REEVES.

THOSE TANGYES

SIR,—In recent issues of MODEL ENGINEER we have been favoured with information on "the Tangye stationary engines"—including reports and pictures of the work carried out by Messrs Kent and Tapper. From the illustrations it looks as though their efforts are beautifully carried out, and I, for one, hope there is more to follow.

S. Reeves' hot-air engine based on the design of R. F. M. Woodforde published earlier this year



about 2 in. dia. connected the headers and were fitted radially around a centre tube about 8 in. dia. except where interrupted by a small door with a mica window about 2 in. \times 2 $\frac{1}{2}$ in., which in turn gave access to a small gas jet in the centre of the tube. In this tube was a cone the large dia. of which was a little above the width of the little door.

The upper end of the cone was about 2 in. in dia. In the walls of the centre tube were three $\frac{3}{4}$ in. dia. holes, pitched at 120 deg. and a little above the base of the cone.

What would I give for one of these now...! This condenser passed on during the first world war when the family moved into the country. Has anyone come across anything in catalogues or libraries? Grasscroft, Oldham, R. C. ROBERTS. Lancs.

HOT-AIR ENGINE

SIR,—My photograph shows a hot-air engine based on Mr Woodforde's design of earlier this year.

It is of slightly different layout, initially dependent on available scrap. Perhaps it is tidier, for it allows the

one) with dural piston lugs pin and small end, as in motor-cycle practice.

The components were built up by silver soldering instead of screwing, as in Mr Woodforde's design. There is a short straight pipe to the power cylinder—no loops or bends. This is not shown well in the photograph. The fuel arrangements are based on Mr Westbury's article in the same issue. I made the mushroom burner, but it gave too diffused a flame, although with reduced number of holes; so I reverted to a plain $\frac{3}{8}$ in. dia. burner but had erratic feed until I made an oversize diameter feed tube of paper thickness, leading to burner tube.

There is a two-step pulley on the shaft and I have to press quite hard on it before the engine begins to stall.

The displacement cylinder has a copper end cap. The rear end of the rod was drilled up and tapped 8 BA, nicked into the hole to facilitate silver soldering of the closed cylinder, and sealed by a screw with the head filed off. This appears better than some other closure methods and it allows a thin end plate.

Your correspondent ran his engine side by side with mine. His had been precision timed at 600 but he reckoned

Work of this nature is not wasted; in most cases it is impossible to preserve the originals, but with an accurate model this can be kept for all time. I do hope the younger generation of model engineers will take an interest in the early engines and attempt to keep them alive. Much is being done in this connection regarding the steam locomotive and traction engine, but in the main the stationary engine seems to be neglected. However, Edgar T. Westbury is now giving a lead and his writings are excellent, even if some of the information has already been published.

My photograph taken in North Eastern Transvaal, not far from the Rhodesian border, shows the remains of a Tangye stationary engine. Goodness knows how it got there or what will eventually happen to it.

I looked around to try and find something to show up the name Tangye in the way of chalk or white stone, but could find nothing. The name is cast round the front of the bed plate and, oddly enough, on the side is cast the size of the cylinder which reads 14 $\frac{1}{2}$ in. \times 21. I tried to find an engine number but was

POSTBAG . . .

unable to do so, but I did note on the crankshaft that there were two eccentrics, and I presume the engine was reversed as required.

The general condition of the parts was good, but that, no doubt, is due to the climate, which is fairly dry. Well, that's the end of, possibly, a beautiful engine carried out by talented craftsmen, but this story may be of interest to readers.

Johannesburg, GEO. E. PERREM.
South Africa.

LOCOMOTIVE SPRINGS

SIR,—Springs, those small but very important pieces of helical wire that suspend our small locomotives—I have seen engines on the track that are almost solid as a rock and others that jump about like a jelly. There are others, of course, that are models of perfection and ride beautifully.

Our old friend LBSC tells us to wind up our own from such and such gauge of wire and this I have done for all of my locomotives in the past, but somehow after a little use these springs lose their length and become tension springs instead of compression, and when exchange becomes due it is a nuisance to take down all the brake gear.

Thinking that I would give my new engine a real super suspension spring I wrote to a famous spring manufacturer, quoting what I wanted, and hopefully enclosed a postal order to cover cost and postage, or so I thought.



Snapshot from J. R. Elston depicting a length of very early railway track



Remains of a Tangye stationary engine lying on a road in North Eastern Transvaal

I was surprised when I received a letter from this firm quoting 22s., four times the amount I had sent and a delivery date of four to five weeks. Perhaps I was too optimistic!

I have no doubt that the firm was correct in its prices but I considered it a bit too much to pay for such small items, important as they are to the efficiency of any engine.

So the object of this letter is: Is there a special wire that I can use that will retain its tension when wound into springs? Cannot our suppliers market a good spring at the right price, the springs to be properly tempered and have correctly ground ends? On the locomotive now nearing completion, I wanted $\frac{1}{4}$ in. o.d. for the engine and $\frac{3}{8}$ in. o.d. for the tender, these to be enclosed in thimbles.

Bideford, Devon.

J. DAVIES.

EARLY TRACK

SIR,—I am enclosing a snapshot of what, I think, is an example of very early railway track. About a dozen pieces have been used to make a farm road over a stream, which drains out from under the main LMS line at Irchester. This little bridge has been in existence for 50 years, to my knowledge, and might well have been built when the main line was completed.

The track is about 10-12 in. at the base, about 2 in. across the top and about 8-9 in. tall. The top of the rail is worn down one side, and shows distinct sign of wheel wear.

If anyone is interested I will get exact measurements, with a little piece of the metal for analysis.

Rushden,
Northants.

J. R. ELSTON.

A model 4.5 in. Mk II Howitzer

(Continued from page 220)

to protrude, and the lower portion of this is protected by an auxiliary scoop-shaped shield riveted in position. The right-hand side of the main shield bears a small bracket, which carries two coils of rope spliced and whipped to steel towing hooks.

Two forms of sight are provided—one a rocking-bar and the other a No 7 dial sight.

A series of four dummy projectiles, representing common, shrapnel, high explosive and smoke-bursting shells coloured to suit and fitted with brass "fuzes" and copper driving bands, complete the model.

The following components have semi-polished natural finishes: breech mechanism and barrel; sights; brake levers and quadrants; elevating and traversing hand wheels, shafts and quadrants; hand-traversing lever; and spade (on side of trail).

The remaining parts are painted field green, with the exception of the toolcase at the fore end, which is brown to represent tanned leather.

The principal dimensions of the model are: calibre 0.45 in.; overall length (muzzle to end of hand traversing lever) $16\frac{1}{2}$ in.; overall length of barrel and breech $7\frac{1}{2}$ in.; outside diameter of tyres $3\frac{3}{8}$ in.; total width over hub caps $7\frac{3}{4}$ in.; height (ground to top of shield) $6\frac{3}{4}$ in.; recoil $2\frac{1}{2}$ in.; maximum elevation 30 deg.; maximum depression 5 deg.; maximum traverse 8 deg. (4 deg. each side of centreline).

The construction of the model occupied just under 400 hours of spare time over a period of ten months.



WITH the object of creating something new for the model racing car fraternity, the Model Rail Car Association is holding a national championship similar to the full-scale World Drivers' Championship with positions decided on the points awarded to each driver during the season.

The idea itself is not new, having been discussed at various meetings of the association, but David J. Lamb has worked hard to bring it into shape since he took over the secretaryship in April. His provisional regulations were received with enthusiasm by the committee, and the draft was not changed apart from a few additions to cover every item. The committee decided to put the idea into operation at once.

Each formula is to be treated as a separate event. Regard will be had to the varying performances of the different classes of engine and to the limited finances of younger members.

There is a trophy for each formula as laid down in the association's racing regulations, but *formula libre* are excluded. Open meetings serve as the qualifying rounds, subject to the approval of the organising clubs, and the points are awarded not to the car but to its owner. Besides including all open meetings so far, the scheme will welcome any club that has not yet decided on its dates.

A clause governs the entry of more than one car in any event, and there are also regulations allowing protests—all of which must be lodged with the track committee immediately afterwards.

Progressive positions will be published after each event, but the association hopes (says Mr Lamb)

CLUB NEWS

EDITED BY THE CLUBMAN

that "no enterprising person will consider opening a book on the probable winner!"

All affiliated members, including private members and those overseas, are entitled to take part, and those unable to attend may nominate a proxy driver if the entry is received in good time by the person requested.

No fee is asked. The competitor need only enter his car in the ordinary way, or as the organising club requires.

"In a final word," adds Mr Lamb, "it is hoped that this scheme will encourage larger and more reliable entries to the meetings to be held."

NEW CAR TRACK

Four entries of cars, together with an independent entry from a junior member, have been submitted for the Model Engineer Exhibition by the **Miniature Motor Sport Club**.

I hear from secretary T. H. Toogood that the MMSC now has a workshop at Boston Manor and is expecting to take delivery of the baseboard for its new track early in September. The club's small track, as demonstrated at Northolt with the new gate-type track entry in use, proved a success in that the cars could be inserted and removed more quickly. It will be necessary to make the movable section stronger for opening.

NORTHOLT'S SHOW

Mention of Northolt comes as a reminder that **Northolt MRC** is preparing for its annual exhibition on September 14. Several other bodies have been invited to exhibit—among them the famous Talylyn Society.

At Northolt's annual meeting several improvements and modifications were suggested for the club's layout. Old friends of R. G. Turner will be pleased to know that he is now chairman, in recognition of his past services.

A YEAR'S HARD WORK

No tribute can be too high for some of our club officials. When K. A. Stroud resumed the treasuryship at the annual meeting of **Stockport and District SME** he was beginning his eighth year in that important role.

All the members of this very active society well deserve a good rest this summer. Behind them lies a year of hard endeavour for the club—a

year when ordinary pleasures were cheerfully sacrificed to the task of building the new locomotive track. If bad weather hindered them it did not prevent the track's progress.

It was not all austerity. Somehow a few outings were fitted in—just to relieve the monotony of mixing cement and laying blocks.

Secretary **William Daley** of 10 Albany Road, Wilmslow, Cheshire, has a welcome for all model engineers in the Stockport district to come and join the club—perhaps at one of its meetings at the Foresters' Hall, Churchgate, Stockport, on the first and third Friday of each month. "And," says Mr Daley, "to societies and friends everywhere, our best wishes."

VARIETY, EH!

For two months in the summer **Birmingham Ship Model Society** does not meet. The talks then resume in September.

Captain F. J. Marsden, RN (Retd), takes the Panama Canal as his subject on September 13, and on October 18 Dr Stanley Wood speaks on a doctor afloat. Other talks scheduled are: "Ship Lines and Plans for Modellers" by A. E. Field on December 20; "Underground Cave Exploring" by C. L. Railton on January 17; "Ships on Stamps" by Dr J. Gibbs on April 18; and "Mass Production Methods in Modelling" by F. A. A. Pariser on June 20.

It will be seen from this programme that **Birmingham SMS** provides for a great width of interest. Captain Marsden, who is the secretary, will be found at 15 Cartland Road, Birmingham 14 (Hig. 2871).

BEER IN BUCKETS

Events on the programme of the **City of Worcester Show** at Pitchcroft racecourse included a flat race for steam wagons and a beer-in-bucket race.

The organisers arranged a display of steam vehicles for the first day of the show and a traction engine rally on the second. Unfortunately, the notice for the Diary, like several similar announcements this summer, reached me far too late.

I hope that the display, the rally and the show as a whole were a great success—and that somebody enjoyed emptying those buckets!

ME DIARY

August 17 The Weald of Kent Traction Engine Club, rally of traction engines and steam rollers, The Old Recreation Ground, Paddock Wood, near Tonbridge, Kent.

SMEE Open Day at headquarters, 28 Wanless Road, SE24. Pre-view of ME Exhibition exhibits. Visitors welcome, refreshments.

August 18 Birmingham SME members' social day.

MPBA Southampton regatta.

August 21 Model Engineer Exhibition opens at New Horticultural Hall, Westminster, 11 a.m.-9 p.m. (Aug. 21-31, except Sunday).

August 24 Huddersfield SME regatta. Birmingham SME track at High Duty Alloys sports field, Redditch. Bethnal Green SMEE at Borough of Leyton Show, Coronation Gardens, Leyton, London.

August 25 Malden and District SME annual loco gala day. Invitation to all ME Exhibition visitors.

August 31 Last day of Model Engineer Exhibition.

September 1 MPBA Grand regatta.

September 6 Rochdale SMEE "Building the Seal," H. Bonsor.

Model Engineer

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Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London N.W.1. Phone: Euston 4661.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311-12.

ML7 1/3 Motor, cabinet, three 4-jaw drill chucks, swivel vertical slide accessories. 0-½" bench drill, "Hielan" Lassie" chassis, small compressor ½ motor need assembly, hardly used, stored. Quantity "M.E." Write, appointment, £65.—DAPLING, 40, Oundle Avenue, Bushey Heath, Herts.

£65. M.L.7 motorised on Myford cabinet universal slide, chucks, tools, etc.—2, Isabella Road, Homerton, London, E.9.

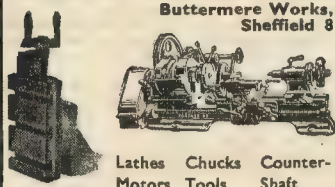
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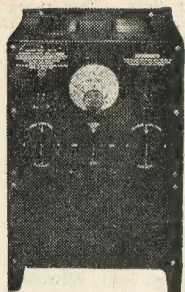
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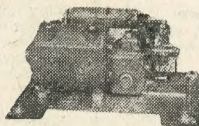
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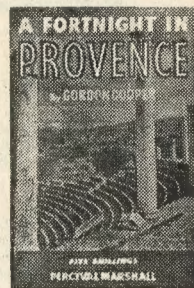
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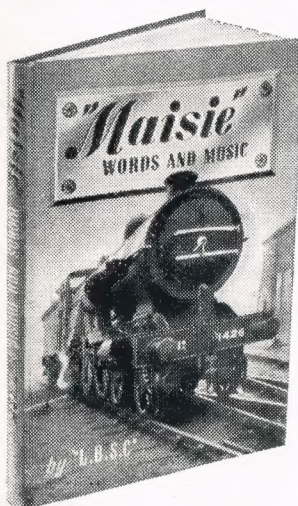
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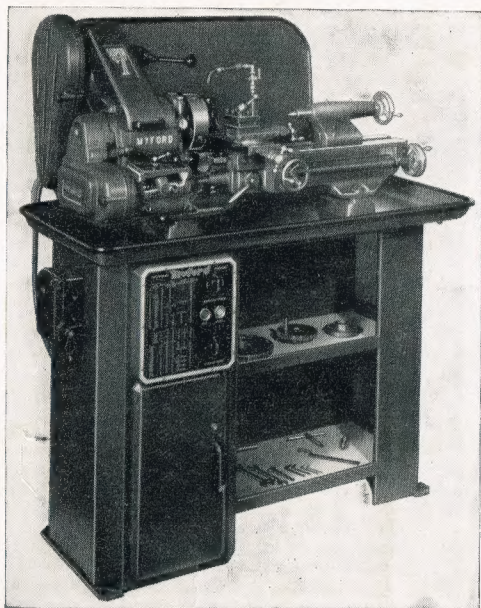
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